A THREE-PRONGED STRATEGY TO SOLVE THE PROBLEM OF LONG-RANGE MISSILE PROLIFERATION

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Abstract

The threat of long-range missile proliferation has been growing since the end of World War II. Today some 28 countries possess long-range missiles and this number is expected soon to grow by one-third. Throughout the Cold War, the U.S. viewed the missile threat in an East-West context. However, beginning with the 1980's Iran-Iraq "War of the Cities" the U.S. view of the missile threat began to change. Third World rogue states such as Iran, Iraq, Libya, and North Korea gained access to long-range missiles and demonstrated a willingness to use them. The proliferation of missiles to these states added to the growing concern over the proliferation of nuclear, biological, and chemical weapons. Together, missiles and unconventional warheads created the potential of rogue states using weapons of mass destruction. In response to these particular problems (and others), the U.S. and its partners in the G-7 announced the formation of the Missile Technology Control Regime (MTCR) in 1987. The purpose of the MTCR was to prevent the proliferation of missiles capable of delivering nuclear weapons. This non-proliferation regime became, and still is, the cornerstone of U.S. and Western efforts to stop missile proliferation. However, it has become apparent that preventive non-proliferation efforts alone can not halt missile proliferation. The Gulf War vividly demonstrates that rogue states will use long-range missiles to attack U.S. interests. Hence, the time has come for the U.S. to move beyond a preventive missile non-proliferation strategy to protect American national security interests. This thesis proposes the use of a three-pronged missile counter-proliferation strategy to nullify the threat facing the U.S. today. This strategy consists of strong non-military actions based in the MTCR, deploying a three-layered missile defense system, and building the offensive capability to destroy rogue state long-range missiles as required. Part I of the thesis defines the missile proliferation problem in post-Cold War terms, examines the Douhetian missile strategy of rogue states, and looks at how rogue states are likely to

acquire long-range missiles. Part II analyzes the anti-proliferation end state desired by U.S. policymakers, and identifies methods to achieve that end state. Part III presents a three-pronged strategy, looks at three risk levels associated with applying the strategy, and settles on the low-risk option to solve the missile proliferation problem facing the U.S. today. Ultimately, for real-time responsiveness to the threat, the suggested strategy may lead to space-based weapons and space-based intelligence. However, the need to act now against the missile proliferation threat to U.S. national security is clear. As President Clinton states, the U.S. and West must respond to the threat posed by "the proliferation of weapons of mass destruction, whether they are nuclear, chemical, or biological, and the ballistic missiles that can rain them down on populations hundreds of miles away. If we do not stem the proliferation of the world's deadliest weapons, no democracy can feel secure."

INTRODUCTION

Since 1945 the number of countries in possession of long-range missiles has grown from one (Germany) to a confirmed number of 28.[1] By the year 2000, this number is expected to grow to about 41.[2] Even more ominously, CIA Director James Woolsey states that by 2001 several countries may have long-range missiles capable of striking the continental U.S., and some of these countries are clearly hostile to American interests.[3] To make the situation even worse, rogue states like North Korea are also acquiring nuclear, biological, and chemical (NBC) weapons for their missiles.[4] The possibility that hostile nations will combine NBC payloads and missiles into weapons of mass destruction (WMD) poses a grave threat to U.S. national security interests.[5] This emerging menace of direct strategic harm to the U.S. prompted Defense Secretary Les Aspin to note that American national security requirements have recently undergone a "fundamental change."[6] President Clinton put it this way -- "One of the most urgent priorities must be ... [to attack] the proliferation of weapons of mass destruction, whether they are nuclear, chemical, or biological, and the ballistic missiles that can rain them down on populations hundreds of miles away. If we do not stem the proliferation of the world's deadliest weapons, no democracy can feel secure."[7]

This thesis focuses on combating long-range missile proliferation. It proposes the U.S. should implement a three-pronged counter-proliferation strategy composed of non-military actions, to include diplomatic, political, informational, and economic options; ballistic missile defenses designed to work at the operational (theater) and strategic (global) levels of war; and a preemptive counter-missile capability. There are two reasons for proposing this three-pronged missile counter-proliferation strategy. First, the non-military measures used in the past to prevent missile proliferation have been largely

unsuccessful. This failure calls for stronger U.S. measures. Second, a three-pronged strategy provides the lowest affordable risk to the U.S. It raises the military costs of long-range missile proliferation and lowers the benefits. As a result, we increase the potential of reversing missile proliferation either voluntarily or by force. The addition of U.S. military force to counter-proliferation actions is new and in combination with non-military actions may reap future success in solving this growing problem.

To address the problem of missile proliferation and propose a viable solution, this thesis has three parts. Part I looks at the general problem of missile proliferation in a post-Cold War world. It does so by defining what makes up a long-range missile of proliferation concern, examining the military relevance and possible employment strategies of long-range missiles in the hands of rogue states, and looking at the possible acquisition strategies our adversaries use to acquire long-range missiles. With the problem set, Part II then analyzes the problem of looking for a way to combat missile proliferation. It goes about this task by identifying the desired U.S. outcome to the missile proliferation problem. It also identifies a mechanism to solve the problem, including three primary and three secondary actions designed to trigger the mechanism. Finally, with the problem set and analyzed, Part III offers a solution in two steps. First, Part III looks at three levels of risk (and cost) associated with a three-pronged counter-proliferation strategy and selects one option. The paper then takes the option and makes implementation recommendations on how to apply the three-pronged strategy to thwart missile proliferation.

PART I

-- THE PROBLEM OF LONG-RANGE MISSILE PROLIFERATION --

To address the problem of missile proliferation, we must begin by determining what is a long-range missile of proliferation concern. To answer this question, we must define what is a long-range missile, outline what constitutes proliferation, and identify who are the U.S.'s long-range missile adversaries. After establishing this common frame of reference we will then examine the military relevance and the possible employment strategies of long-range missiles by rogue states at the operational and strategic levels of war. Using the Gulf War as a back-drop, we can see how Iraq used long-range missiles, and from their use we can draw some counter-proliferation conclusions. Finally, to complete our examination of the missile proliferation problem, we will look at the missile acquisition strategies potential adversaries might use to acquire long-range missiles. By gaining a better understanding of missile proliferation, its military usefulness, and how hostile countries acquire missile technology, the U.S. can further refine its strategy to counter long-range missile proliferation.

The strategy starts with an understanding of what is a long-range missile of proliferation concern. This paper defines such a missile as one that is, 1) capable of a range of 300 km with any payload, 2) capable of inflicting high-leverage strategic harm against U.S. national interests, 3) impervious to U.S. defenses, 4) able to change other nations' perceptions of what country is the leading power in a given region, and 5) in the hands of any country that is not a member of the Missile Technology Control Regime (MTCR). But to effectively apply a counter-proliferation strategy it is important to understand the background of the above definition.

WHAT IS A LONG-RANGE MISSILE OF PROLIFERATION CONCERN?

To determine what missiles are of proliferation concern first requires an understanding of what a long-range missile is. To answer the question, we turn to the MTCR. Established in 1987, the MTCR is a non-binding group of 25 nations committed to combating missile proliferation.[8] Its definition of a long-range missile is fast becoming the accepted international standard in the context of missile proliferation. First, the MTCR identifies a missile as any unmanned aerospace vehicle. In turn, unmanned aerospace vehicles are "Complete rocket systems (including ballistic missiles systems, space launch vehicles, and sounding rockets) and unmanned air vehicles systems (including cruise missile systems, target drones and reconnaissance drones)" capable of delivering a WMD.[9] Second, the MTCR identifies any missile capable of flying 300 km with any payload as a long-range vehicle.[10] Any payload means any size.[11] However, in military terms it also covers any NBC warhead.[12] Therefore, while the MTCR definition targets NBC-capable missiles, by extension it also covers conventional missiles, since these too are capable of being used as a WMD. Armed with this MTCR definition of a long-range missile, we next turn our attention to what is the meaning of proliferation.

Our understanding of missile proliferation depends on a post Cold War definition of the term. Before the 1980's, there was little question of what was meant by proliferation. Most U.S. (and Western) officials identified the spread of nuclear weapons as the essence of proliferation; however, the U.S.'s purely nuclear focus began to change as a result of the Iran-Iraq War. Although not used together, the belligerents' open use of chemicals and long-range missiles as weapons concerned the U.S. Missile warfare between Iran and Iraq had a destabalizing impact on the regional balance of power and caused widespread harm to civilians. It also raised the concern that long-range missiles could deliver nuclear warheads, that the range of the missiles could increase to directly

threaten Europe or even the U.S., and that there were no defenses to counter a long-range missile in flight. In response to this emerging threat, the Reagan Administration began multinational negotiations with the G-7 to take counter-proliferation actions.[13] The negotiations culminated with the creation of the MTCR, formally announced in 1987.[14] The purpose of the MTCR was to "limit the proliferation of missiles capable of delivering nuclear warheads."[15] In 1991, the MTCR extended its coverage to include long-range missiles capable of delivering WMD, including NBC weapons. The push for this extended coverage was a direct response to the threat of WMD use by Iraq against coalition forces in Desert Shield and Desert Storm. Thus, by 1993, the meaning of proliferation had grown to cover a number of weapons and technologies. For example, Henry Sokolski, the former Department of Defense Deputy for Non-Proliferation Policy, listed nine components of proliferation:

> "(1) weapons of mass destruction (nuclear, biological, and chemical -- or NBC -- munitions); (2) weapons of mass destruction and the means for their delivery; (3) weapons of mass destruction and the missiles needed to deliver them; (4) special weapons; (5) advanced weapons; (6) advanced conventional weapons; (7) destabalizing numbers and types of advanced conventional weapons; (8) conventional weapons; and -- to complete the circle -- (9) weapons of proliferation concern."[16]

However, this wide spectrum of meanings required a new definition which covered more than nuclear weapons and in the process explained why those weapons covered were a proliferation threat. Assistant Secretary of Defense Henry S. Rowen had previously offered such a definition in his 1990 testimony to the Senate Select Committee on Intelligence. Rowen observed:

> "A weapon or weapon-related technology is of proliferation concern if, (1) it enabled another nation to inflict high-leverage strategic harm against the U.S. or its friends; (2) the U.S. lacked effective defenses against this capability; and (3) its mere

acquisition could change other nation's perceptions as to who was the leading power in a given region."[17]

Clearly Rowen's definition of proliferation applies to long-range missiles and is the operative definition used in this paper. Further, those in the Defense Department struggling with the issue of missile proliferation should formally adopt this definition. Still, it is important to clarify two questions associated with Rowen's definition. The first is "what is the meaning of high-leverage" while the second is "what is the meaning of strategic harm?" The term "high-leverage" does not mean the same thing as "high-technology."[18] It encompasses low and old technology as well as high technology.[19] For example, the low technology of the Scud missile comes from the 1945 V-2 missile.[20] However, in the Gulf War, the Scud provided as much missile leverage in the operational theater as did the U.S.'s high-technology U.S. Peacekeeper missile. The reason for the Scud's high-leverage was its potential for causing strategic harm as a WMD, and by Iraq's capability and willingness to use the Scud against Israel. As Sokolski points out, in the post-Cold War world "strategic harm" must account for the fact that wars are more like "Desert Storm than ... *Red Storm Rising*."[21] This in turn raises the question of what countries presently pose a missile threat to the U.S.

Who are the U.S.'s adversaries in missile proliferation? The answer to this question is not as obvious as it first might appear. Some adversaries, like Iraq, are readily apparent and can quickly become an enemy. Other adversaries are more like friends than enemies.[22] One example is Brazil and its Sonda space launch vehicle (SLV) program. This SLV program, and others like it, are potentially dangerous to the U.S. because as a non-adherent to the MTCR, Brazil may transfer Sonda technology to rogue states or build offensive missiles capable of striking the U.S.[23] Adversaries can also include friends who might use long-range missiles against mutual enemies in such a way that it drags the U.S. into a conflict. For example, South Korea's pursuit of a long-range missile (or SLVs) may raise tensions with North Korea and accelerate the latter's

development of the No Dong missile and the Taepo Dong-2 (TD-2).[24] Because the TD-2 may threaten the continental U.S. directly, American leaders should oppose South Korean acquisition of long-range missiles or SLVs, and push for a missile free peninsula.[25] A similar situation exists in the form of Israel's long-range missile, the Jericho II, and its SLV equivalent, the Shavit.[26] Here, for instance, the U.S. objective should be to dismantle these destabalizing systems and provide Israel with a stabilizing area defense missile such as the Theater High Altitude Area Defense (THAAD) system at the earliest opportunity.[27] Therefore, rather than list U.S. adversaries in missile proliferation it's more effective to use a prescriptive definition. U.S. adversaries in missile proliferation are those nations that are not members of the MTCR.[28]

Ultimately, when the U.S. faces the uncertainties of applying the above definition of a missile proliferation adversary to world-wide situations, it should take the position that "a prudent expenditure of effort today in curtailing proliferation can pay big dividends in the future."[29] Thus, if a nation like Indonesia, that is neither a formal ally nor a hostile enemy, announced it was fielding a SLV, it is still in the interest of the U.S. to persuade it to avoid building a strategic long-range missile system.[30] Space launch vehicles are of particular interest because many pundits do not consider them a threat. However, because there is no significant difference between the strategic damage a SLV and a long-range missile can do to the U.S., SLVs should be part of a workable U.S. strategy against long-range missile proliferation.[31] Within this context, our prescriptive definition of long-range missiles of proliferation concern adds focus to a missile counter-proliferation strategy and helps identify which long-range missiles U.S. policymakers and warfighters should work to eliminate. Yet, to further understand what embodies a missile of proliferation concern and how to combat it, it is important to appreciate its military relevance and employment at the operational and strategic levels of war.

THE MILITARY RELEVANCE AND EMPLOYMENT STRATEGY/DOCTRINE OF LONG-RANGE MISSILES

Examining the military relevance and employment strategy of long-range missiles helps formulate the non-military and military components of an effective counter-proliferation response. In exploiting this connection, it is important to first address the issue of whether long-range missiles are militarily relevant in the hands of rogue states. The Gulf War serves as a good example.

Many in and out of the military believe long-range missiles like the Scud are politically relevant but militarily irrelevant.[32] While it's true that the Scud was not decisive against coalition forces in Desert Storm, this does not mean that it wasn't of great military relevance.[33] In fact, the Scud and other long-range missiles, as defined in this thesis, are both politically and militarily relevant at the same time. As a military weapon, missiles target an enemy's *will* or *capability* to fight. The use of a military weapon against either target set, if it yields victory, is militarily (as well as politically) relevant. A weapon like the Scud might currently be more effective against one target set or another, but either way it is still of military relevance. Further, if one subscribes to the Clausewitzian view that "war is nothing but the continuation of policy by other means," anyone who accedes that Scuds were politically relevant to the Gulf War is by definition saying they were also militarily relevant.[34] Yet perhaps even more important than the Western view of relevance is the rogue state view of relevance.

The military relevance of long-range missiles is not solely defined by the West. After all, Clausewitz pointed out that "war is never an isolated act -- war is always the collision of two living forces."[35] Thus, it is critical for the U.S. to view the relevance of long-range missiles through the eyes of rogue states like Iraq. States like Iraq see long-range missiles as a relevant way to gain politico-military leverage and, in time, military utility against the U.S. and its friends. The U.S. must recognize that rogue states are also

searching for an affordable method to defeat Western "interference" in their regional designs. Missiles are relevant because their threatened or actual use may compel the U.S. or its friends to do a hostile nation's will.[36] Such a nation further believes that obtaining and combining NBC warheads with long-range missiles strengthens this type of leverage. While many Third World states such as Iraq, Iran, Libya, North Korea, India, and Pakistan held this belief before the Gulf War, its likely even more Third World countries accept it after the war.[37] Indian Air Commodore Jasjit Singh (Ret) brought this point home when he stated that, if the Third World learned nothing else from the Gulf War, it was that countries should not go to war with the U.S. unless they have nuclear weapons.[38] Implicit in this statement are biological and chemical weapons, and the long-range missiles capable of delivering WMD. Therefore, the U.S. should fully expect Third World rogue states to continue to pursue both missiles and unconventional weapons and combine the two. Once in their possession, the mere threat of use will have high-leverage on Western and friendly forces by threatening strategic harm.

As demonstrated, the acquisition and use of long-range missiles is of politico-military relevance to rogue states such as Iraq, Iran, Libya, and North Korea, and Third World countries such as India and Pakistan. The result is that long-range missiles are by necessity of politico-military relevance to the U.S. Hence the U.S. can not ignore these missiles at the operational and strategic levels of war. Yet, this provides little insight on how to focus U.S. counter-proliferation strategy. For example, if defensive missiles are part of the counter-missile strategy, should they protect military point targets or civilian population centers? Should the U.S. limit missile defenses to block potential regional hegemons or should it prepare to defend its own borders? The answers to these questions depend on how the U.S. expects rogue states to employ their missiles. Consequently, establishing that missiles are militarily relevant is not enough. We must dig deeper to design a counter strategy to rogue state missile employment strategy at the operational and strategic levels of war.

Iraq's use of long-range missiles in the Iran-Iraq War and the Gulf War seems to suggest that rogue states will primarily use a Douhet-like strategy at both levels of war.[39] They will use long-range missiles against population centers to drive down civilian morale to the point that the population will force a change in government policy.[40] In the case of missile proliferation, the strategic level of war refers to a direct threat to the continental U.S. or the major population centers in Western Europe, a threat with potentially global repercussions. Likewise, for missile proliferation, the operational level of war refers to threats to U.S. interests, objectives, and forward based forces outside the continental U.S. We begin by addressing the operational level of war.

At the operational level of the Gulf War, Iraq unsuccessfully tried to use Scuds to break-up the Coalition. It attempted to break Israeli civilian *will* and provoke the Israelis to fight. Some would say such attacks lower civilian morale but not to the level that they trigger a reaction which changes government policy.[41] While a Douhetian strategy may not change government policies in the case of oppressive regimes, it may apply to democracies such as Israel and the U.S.[42] In the case of Vietnam, the American people did influence a change in U.S. policy and force a withdrawal that resulted in a politico-military defeat. Saddam may have reasoned that if he could recreate this scenario in the Gulf War, by breaking apart the Coalition and leaving the U.S. alone to face potentially high casualties, he could win. There is no way to prove Iraq could have broken the Coalition and won the Gulf War though this strategy. Nevertheless, there is evidence key U.S. policy decision makers and warfighters were concerned with this possibility. For example, the perceived threat of Israel initiating reprisal strikes in response to Scud attacks prompted the U.S. to send the Deputy Secretary of State, on more than one occasion, to persuade the Israelis not to enter the war. Also, there was enough operational level concern for General Schwartzkopf to express the opinion that had Israel entered the war the Coalition would have crumbled.[43] If the Coalition had crumbled, it is likely that at best, the U.S. would have been victorious at a higher cost in American lives,

and at worst, it could have resulted in the politico-military defeat of the U.S. and any remaining Coalition allies.[44] The perceptions of key U.S. politico-military leaders, that long-range missiles could potentially be decisive at the operational level of war, may be of little importance to future U.S. counter-proliferation actions. On the other hand, perhaps their perceptions lead to valid (but hard to prove) lessons and the U.S. should not tempt fate by lightly brushing off strong future non-military and military counter-missile efforts. As the Gulf War Air Power Survey reports, the conventional Scud is currently a "distinct political and psychological threat."[45]

The case of Iraq also suggests rogue states seek long-range missiles for more than just a Douhetian strategy at the operational level of war. In the not too distant future, the ability of rogue states to integrate Global Positioning Satellite (GPS) receivers into missile guidance systems will provide them the accuracy to strike at the *capability* of an opponent to wage war.[46] This is a very real possibility since GPS is now available on the open market and no harder to buy than a computer.[47] Some evidence suggests Third World countries are already acquiring GPS receivers.[48] Rogue states also want solid propellant long-range missiles to further enhance their ability to strike at the *capability* of their opponents to wage war.[49] Iraq, for example, wants the ability to employ solid propellant long-range missiles with accurate high-explosive or NBC warheads on fixed point targets.[50] Through Egypt and Argentina, it has spent $5 billion since the mid-1980's to develop the solid propellant Condor missile, now renamed the Badr 2000.[51] With the Badr 2000 and a GPS guidance system, Iraq could target fixed military point targets, such as airfields, seaports, command-control-communication centers, and logistic supply centers.[52] As seen in the Gulf War, the Badr 2000 would also enjoy a much higher degree of penetrability than aircraft systems. Almost half of the Scuds fired reached their target, despite Patriot ATBM defenses.[53] A Badr 2000 guided by GPS will give Iraq, and other rogue states, an effective operational level weapon to strike an opponent's *capability* to fight.[54] The potential impact of such a weapon is best illustrated

by the near miss of the ammo-filled *Tarawa* docked in Dhahran.[55] As one former U.S. government official stated, "Next time they won't miss, ... no ammo, no war."[56] Because of Scud missiles, "you really have to think of fighting wars differently."[57] With missiles like the Iraqi Badr 2000, believed to be far more accurate than Scuds and likely to be sold on the open market, rogue states will have the flexibility to target both the *capability* and *will* of the U.S. and its friends to wage war.[58]

At the strategic level of war, evidence suggests rogue states like Iran, Iraq, Libya, and North Korea, desire the missile capability to defeat the U.S. (and Western) *will* to fight. They hope to attack the U.S. *will* to fight by threatening U.S. population centers with offensive, NBC-tipped long-range missiles. Behind the diminishing threat of nuclear war with Russia, this is the most serious threat the U.S. and the West now face.[59] Even conventionally tipped long-range missiles are of proliferation concern. Once this capability exits in the hands of rogue states, they will seek to exercise high-leverage over the U.S. by threatening strategic harm. The leverage may let rogue states first exercise aggression in their region of the world. If the U.S. or the West then intervene they will do so at considerable risk to themselves.

There are many examples of rogue states and Third World countries pursuing a capability that could be used to directly strike the U.S. and the West.[60] The Iraqi development of the Tamouz 1 SLV and its military equivalent the Al Aabed;[61] the experience of Libya's 1986 Scud attack against U.S. forces stationed in Italy;[62] and Iraq's use of Scud missiles against urban centers in Israel and Saudi Arabia show that there are those willing to use missiles against interventionists. Unfortunately, increasingly sophisticated technology will soon match their resolve. In 1993 Congressional Testimony, CIA Director James Woolsey stated rogue states could have SLV-ICBMs in as little as 8 years.[63] This seemingly gives the U.S. until 2001 to determine how to respond to this threat. Actually, the U.S. does not have that much time to put in place an effective missile counter-proliferation strategy. Director Woolsey's 1994 testimony

subsequently provided a new assessment of the Intermediate Range Ballistic Missile (IRBM) and Intercontinental Ballistic Missile (ICBM) threat facing the U.S.[64] He stated the North Koreans may now have a long-range missile capable of striking the U.S.[65] Missile proliferation experts believe that the possible range of the Taepo Dong 2 (TD-2) may be as high as 5,760 miles, putting Los Angeles within its range.[66] The U.S. should further note the statement made by the Palestinian terrorist Abul Abbas in September 1990. "There is an Arabic saying that revenge takes 40 years. If not my son, then the son of my son will kill you. Some day, we will have missiles that can reach New York."[67]

Thus, while no one knows for sure what rogue states are planning for their long-range missile employment strategy, the prudent military planner must assume it has two parts. One part focuses on the operational level of war while the other focuses on the strategic level of war. Currently, at either level of war, the rogue state strategy is constrained by technology. However, as the Badr 2000 illustrates, it is difficult to say how long rogue states will limit themselves to a Douhet-like strategy. Hence, it is advisable to consider that these states may pursue either a *will* or *capability* strategy. If this occurs, rogue states may consider using long-range missiles based on three factors. First, whether they should target their opponent's *will* and/or *capability* to fight. This strategy decision will partly be a function of the second factor -- the current technical capabilities of existing long-range missiles. Because current capabilities are low, the favored targets at both levels of war are presently *will*-oriented area targets. The third factor, not addressed in this paper, is the status of rogue state NBC programs. Together, these three factors will influence the overall employment of long-range missiles at the operational and strategic levels of war. Any successful U.S. missile counter-proliferation strategy must attack these factors.

In summary, the long-range missile proliferation problem facing the West today at the operational and strategic levels of war yields several conclusions. The long-range missile is indeed militarily relevant at both levels of war, even though currently of

minimal utility against fielded military forces due to technical restrictions. As a result, the rogue state employment strategy at both levels of war is to use these systems for long-range bombing of area population centers, including cities and military complexes, in hopes of defeating the Western *will* to wage war. This is a long-range missile version of a Douhet strategy and doctrine. Additionally, rogue states such as North Korea with its TD-2 long-range missile will soon have the potential to directly threaten the continental U.S. Lastly, the evidence suggests that rogue states desire to improve the military utility of their missile systems and are likely to move in this direction. All of these conclusions bear directly on the thesis of this paper -- the U.S. needs to implement a strong three-pronged strategy, consisting of blocking the spread of missiles, preparing missile defenses to render enemy missiles useless, and employing offensive military capabilities. Having defined missile proliferation, and shown its relevance and projected employment, there is one final aspect of the missile proliferation problem that requires review before we examine our counter-proliferation options. It centers on how non-MTCR countries acquire long-range missiles.

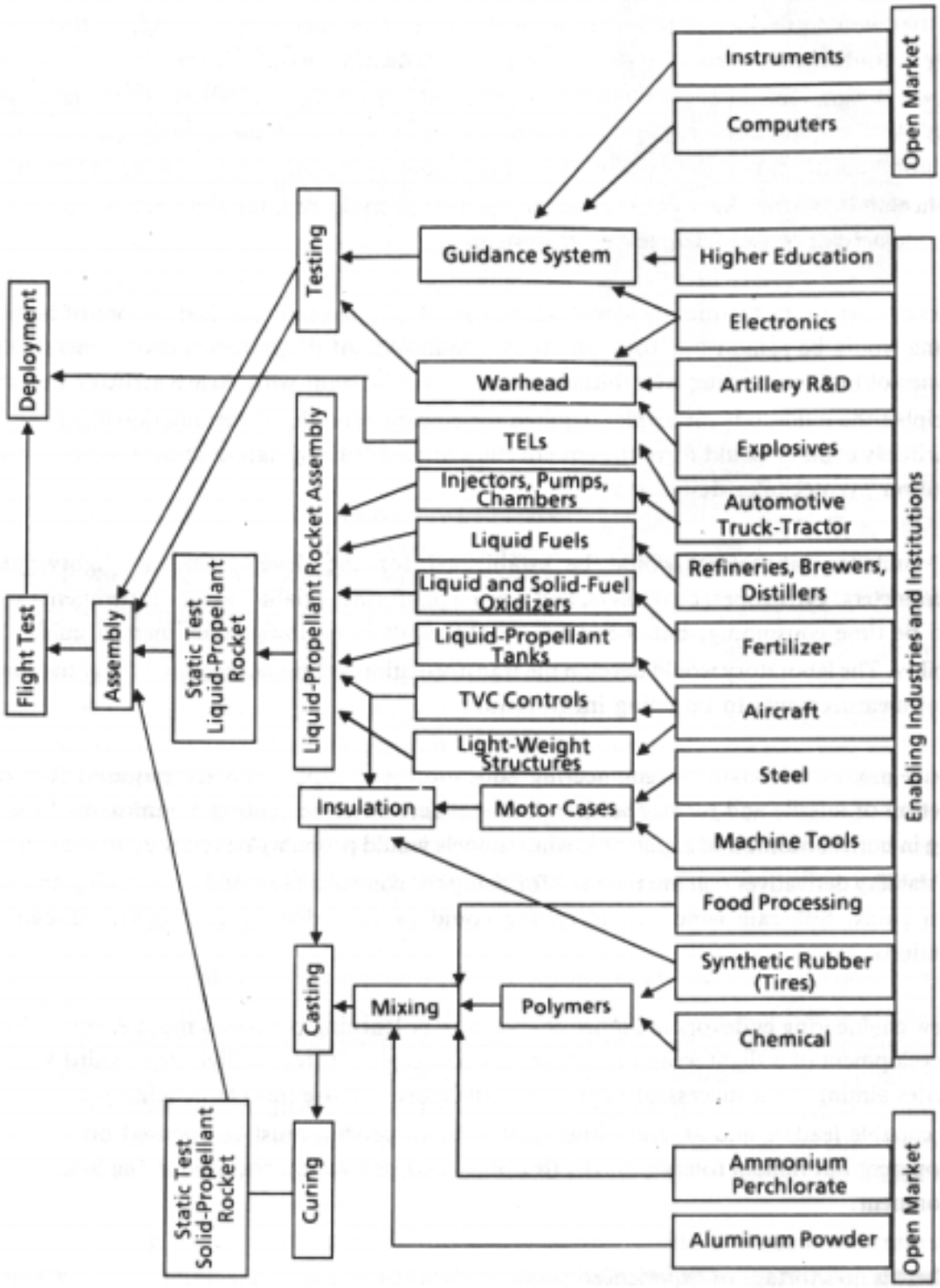
LONG-RANGE MISSILE ACQUISITION

While the previous section showed long-range missiles are militarily relevant at both the operational and strategic levels of war, it is also true their current technical capabilities limit their military decisiveness. As a result, states like Iraq and North Korea are trying to improve the quantity and quality of their missile systems. If the U.S. counter-proliferation strategy doesn't limit future transfers of missile components and technology, rogue states are likely to succeed in acquiring new and improved missiles.[68] As a result, the U.S. must respond to how non-MTCR countries acquire missiles.

Nations that desire to acquire long-range missiles, including friends and allies, use an acquisition strategy that includes one or more of three approaches. The first

approach is the direct procurement of complete missile systems (or subsystems that are assembled later). This approach could include offensive missiles, defensive ATBMs, or SLVs, since they all have similar technical capabilities.[69] The second approach involves overtly or surreptitiously obtaining missile components and technology and using these items to support an indigenous long-range missile production program. Finally, the third approach is to use commercial enabling industries, such as those shown in Figure 1, to support an indigenously developed long-range missile.[70]

Iraq is a good example of a nation pursuing all three approaches to acquire long-range missiles. It first procured the Scud missile from the USSR and its surrogates during the Iran-Iraq war.[71] Once in its hands, Iraq began trying to reverse engineer the Scud and produce it locally. At the same time, Iraq also sought to buy a solid propellant missile with greater military utility. It attempted to buy from Egypt and Argentina an operational Condor missile.[72] However, when Iraq became frustrated with the slow progress made by Egypt and Argentina in delivering the Condor, it started indigenous development of a Condor variant called the Badr 2000.[73] In order to acquire the components and technology for both missiles, Iraq then financed the establishment of the Consulting Engineering firm (Consen) in Europe to procure missile components and technology.[74] Thus, by the late 1980's, Iraq relied on two acquisition strategies to procure long-range missiles. Nevertheless, by 1987, the MTCR successfully implemented a non-military counter-proliferation strategy against the Condor missile.[75] As a result, Iraq turned to the third approach -- acquisition through enabling industries. Iraq began buying legitimate dual use items for enabling industries like those in Figure 1.[76] In the case of the U.S., its response to Iraqi requests for dual-use commercial equipment and technology to support missile development was to approve the export licenses because "it was assumed that the same products would be available to Iraq from non-U.S. suppliers."[77]



Space Saver.

Figure 1 - Indigenous Ballistic Missile Infrastructure. Source: Arnold Engineering Development Center, Arnold Air Force Base, *Short-Range Ballistic Missile (SRBM) Infrastructure Requirements for Third World Countries*, September 1991.

In developing a U.S. counter-proliferation strategy, what can we conclude from the example of Iraq's missile acquisition strategy? First, the U.S. and the MTCR must work together to stop all three means of missile acquisition. More specifically, the Iraq experience shows the great need for detailed intelligence on proliferation activities and the need for decision makers and warfighters to understand that even dual use technology can lead to missile proliferation problems. Second, to be effective, any U.S. counter-proliferation strategy must address all three strategies used by rogue states to acquire long-range missiles. Observing these acquisition strategies suggests that the U.S. (and the West) must prioritize the non-military focus of its MTCR counter-proliferation strategy. Non-military counter-proliferation actions should 1) restrict the transfer of long-range missile technology, 2) limit the transfer of components and raw materials, and 3) protect against the transfer of complete systems. Of these three approaches to acquiring missiles, the greatest long-term concern is over the transfer of missile technology. This danger calls for renewed efforts to counter the transfer of missile technology. Lastly, and perhaps less apparent, the U.S. and MTCR members must deny missile access to their non-MTCR friends and allies. For example, in adopting the above priorities, the U.S. should satisfy the legitimate Israeli need for missile defenses by providing it a complete missile system. The Israelis should not receive those technologies allowing them to build their own defensive missile system. This means the U.S. should offer to provide Patriot missiles and accelerate the development of a follow-on point and area defensive missile for Israeli use, instead of co-developing the Arrow missile. The U.S. should take a similar approach, if Israel, or any other non-MTCR country wants assistance with a SLV program -- only in this instance, it should offer launch services to meet the need for lift without transferring a missile, its components, or its technology.

PART I -- INTERIM SUMMARY

In examining the problem of missile proliferation facing the U.S. today, Part I of this paper reviewed three areas. The first area defined what is a long-range missile of proliferation concern. To repeat, such a missile is 1) a missile capable of a range of 300 km with any payload, 2) capable of inflicting high-leverage strategic harm against U.S. national interests, 3) able to elude U.S. defenses, 4) capable of changing other nations' perceptions as to who was the leading power in a given region, and 5) in the hands of any non-MTCR country. After further defining what proliferation is and what nations are among the U.S.'s missile proliferation adversaries, the paper then examined the military relevance and employment strategy of long-range missiles to rogue states at the operational and strategic levels of war. Lastly, the paper examined the three missile acquisition strategies currently used by our adversaries. The conclusion reached is that missiles are relevant at both levels of war, although currently their utility against the *capability* of the U.S. to wage war is low and the U.S. would like to keep this so. However, against the *will* of the U.S. or its allies to wage war, long-range missiles pose a great threat. Because of the severe consequences of even one NBC missile warhead penetrating U.S. air space, the U.S. must implement strong military and non-military counter-proliferation actions to counter the acquisition and use of long-range missiles. The proliferation of long-range missiles with NBC warheads leaves the U.S. and its friends vulnerable to Third World coercion. While Third World states have always been vulnerable to Western air power, the U.S. and Europe have never been vulnerable to Third World aerospace power, until now. The U.S. must respond. However, in the past the response was limited to non-military MTCR actions. While the MTCR is, and should

remain, central to the U.S. missile counter-proliferation response, the continued growth of the threat also calls for a strong military response. Thus, the way forward for U.S. missile counter-proliferation strategy at two levels of war is to employ a three-pronged strategy. It consists of non-military MTCR efforts, to include diplomatic, political, informational, and economic options; strong military ballistic missile defenses; and an offensive counter-missile capability at a level sufficient to respond to the threat. The next logical step leading to an effective U.S. missile counter-proliferation program is to determine the outcome desired by the U.S. and the best method to achieve that outcome.

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[1]. Commander John E. Carey, USN, Theater Missile Defense Initiative, Ballistic Missile Defense Organization, *Sea Based Theater Ballistic Missile Defense* Briefing to the DART, 16 December 1993, chart pj-30201/051493 titled "Global TBM Proliferation (1970-2010). (Hereinafter known as: Carey, *Sea Based Theater Ballistic Missile Defense*.)

2. Ibid., chart pj-30207/052493.

3. During testimony before the Senate in February 1994, CIA Director James Woolsey observed the following: "More than 25 countries, many of them hostile to the U.S. and our friends and allies may have, or may be developing nuclear and biological and chemical weapons, so-called weapons of mass destruction, and the means to deliver them. ... It's certainly the case that several countries are developing ballistic missiles that will have sufficient range to threaten Europe, Japan and other U.S. allies and U.S. forces abroad and that these can be adapted to carry nuclear, biological or chemical warheads. Possession of these by potential adversaries is certainly going to complicate our regional security concerns and it will also complicate our ability to hold coalitions together, as was done successfully during the Gulf War. If Europe, for example, is held at risk by two-stage ballistic missiles in the hands of countries in the Mideast, the difficulty of putting a coalition together in a future Desert Shield/Desert Storm situation could be quite substantial. ... We don't expect any nations beyond Russia and China to develop and produce ICBM's [Intercontinental Ballistic Missiles] in this decade. ... But after the turn of the century, some countries that are hostile to the U.S. might be able to acquire ballistic missiles that could threaten the continental U.S. We can't give you a precise date, whether it's eight years or ten years or 15 years from now by which that might occur. But I think I should say that over the next ten years, we're likely to see several third world countries at least establish the infrastructure and develop the technology that's necessary to undertake ICBM and space launch vehicle development." U.S., Congress, Senate, Committee on Governmental Affairs, *To Examine Nuclear, Biological, and Chemical Weapons Proliferation Threats of the 1990's - Witness*: *CIA Director James Woolsey*. As reprinted by the United States Department of State, Bureau of Public Affairs, Office of Press Relations, 24 February 1993, pp. 2, 25, 26. (Hereinafter known as: U.S., Congress, Senate, *To Examine Nuclear, Biological, and Chemical Weapons Proliferation Threats of the 1990's*.)

4. Some Western countries even go so far as to take the position that possession of long-range missiles spurs the desire to obtain NBC warheads, rather than the other way around. For instance, in the mid 1980's England held the view "that the further spread of nuclear capable missiles could increase the risk of the proliferation of nuclear weapons themselves." Adelphi Papers 252, Martin S. Navias, *Ballistic Missile Proliferation in the Third World* (London: Brassey's, 1990), p. 52.

5. The threat posed by WMD and their missile delivery systems has received a great deal of attention in 1994. In testimony before the Senate, Lynn Davis, Under Secretary of State for International Security Affairs stated that "the spread of weapons of mass destruction and sophisticated conventional arms is perhaps the single most important security threat" facing the U.S. today. She repeated the concern for WMD and missile proliferation in April when addressing the end of the east-west Cold War Coordinating Committee on Multilateral Export Controls, known as COCOM. Further, in a White House fact sheet, White House Press Secretary Dee Dee Myers noted that, "Today the world confronts very different threats to peace, ... These threats are made more dangerous by the spread of weapons of mass destruction and the behavior of such countries as Iran, Iraq, Libya, and North Korea." "Export Controls and Non-proliferation Regimes in the Post-Cold War World," *U.S. Department of State Dispatch*, Vol. 5, No. 11 (14 March 1994): p. 149; (Hereinafter known as: "Export Controls and Non-proliferation Regimes in the Post-Cold War World," *U.S. Department of State Dispatch*.); and, "Reforming Export Controls," *U.S. Department of State Dispatch*, Vol. 5, No. 15 (11 April 1994): p. 206. (Hereinafter known as: "Reforming Export Controls," *U.S. Department of State Dispatch*.)

6. Defense Secretary Aspen reflected that: "The national security requirements of the United States have undergone fundamental change in just a few short years. We won the Cold War. The Soviet threat that dominated our strategy, doctrine, weapons acquisition and force structure for so long is gone. With it has gone the threat of global war. But history did not end with that victory and neither did threats to the United States, its people and its interests. ... [Today, there are] four chief threats to the U.S. First, [is] a new danger of proliferation of nuclear weapons and other weapons of mass destruction [and the missiles to deliver them.] ... Of these dangers, the one that most urgently and directly threatens America at home and American interests abroad is the new nuclear danger. ... The new nuclear danger we face is ... nuclear devices [and the missiles to deliver them] in the hands of rogue states .... The engine of this new danger is proliferation." U.S., Department of Defense, Defense Issues, *The Defense Counterproliferation Initiative Created*, Prepared remarks of Les Aspin, Secretary of Defense, address to the National Academy of Sciences Committee on International Security and Arms Control, Washington, 7 December 1993, Vol. 8, No. 68, p. 1. (Hereinafter known as: U.S., Department of Defense, Defense Issues, *The Defense Counterproliferation Initiative Created*.)

7. "Confronting the Challenges Of a Broader World," *U.S. Department of State Dispatch*, Vol. 4, No. 39 (27 September 1993): p. 651. (This is a transcript of President Clinton's address to the UN General Assembly, New York City, September 27, 1993.)

8. The Missile Technology Control Regime (MTCR) resulted from concern in the early 1980's over the spread of ballistic missiles. The U.S. initiative for the MTCR began with the signing of National Security Decision Directive 70 (NSDD-70) in November of 1982. According to John Harvey and Uzi Rubin, "this directive called for the investigation of ways to control missile proliferation." As a result of NSDD-70, the U.S. Government led the nations of the West to form the Missile Technology Control Regime (MTCR) to combat missile proliferation. Seth Carus, who has written a great deal on the missile proliferation issue, notes that while the MTCR did not become formal until 1987, the U.S. actually began reviewing export licenses for missile proliferation in 1985. Furthermore, Vann Van Diepen indicates that since the formation and announcement of the MTCR on April 16, 1987, it has become the centerpiece of U.S. and Western efforts to stem the spread of ballistic missiles. The MTCR effort now includes 25 member nations with several others publicly stating that they are adhering to the MTCR. According the Major Jeff Renehan, who works for Mr. Van Diepen, as of May 1994 the member nations of the MTCR include: Argentina, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, The Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, The United Kingdom of Great Britain and Northern Ireland, and The United States of America. John Harvey and Uzi Rubin, Co-chair et al., *Assessing Ballistic Missile Proliferation and Its Control*, (Stanford, California: Center for International Security and Arms Control Stanford University, 1991), p. 128; (Hereinafter known as: Harvey and Rubin, *Assessing Ballistic Missile Proliferation and Its Control*.); W. Seth Carus, *Ballistic Missiles in Modern Conflict*, (New York: Praeger, 1991), p. 56; (Hereinafter known as: Carus, *Ballistic Missiles in Modern Conflict*.); Vann Van Diepen,

Director, Department of State, Bureau of Politico-Military Affairs, Office of Chemical and Biological Weapons, and Missile Non-Proliferation (PM/CBM), interview with author, December 1993; Message, U.S., Department of State 374039, 131600Z Dec 93, Subject: Missile Technology Control Regime (MTCR) Plenary Press Release; and, Major Jeff N. Renehan, USAF, Department of State, Bureau of Politico-Military Affairs, Office of Chemical and Biological Weapons, and Missile Non-Proliferation (PM/CBM), telephone interview with author, April-May 1994.

9. This International document can be obtained from the Department of State, Bureau of Politico-Military Affairs, Office of Chemical and Biological Weapons, and Missile Non-Proliferation (PM/CBM). *MISSILE TECHNOLOGY CONTROL REGIME (MTCR) EQUIPMENT AND TECHNOLOGY ANNEX* (available from the Department of State, Bureau of Politico-Military Affairs, Office of Chemical and Biological Weapons, and Missile Non-Proliferation (PM/CBM), Washington, D.C., 1 July 1993), Category II - Item 19. (Hereinafter known as the: MTCR *EQUIPMENT AND TECHNOLOGY ANNEX*, 1 July 1993.)

10. Ibid.

11. Steven E. Gray, "Missile Payloads and Range-Payload Tradeoffs" (Lawrence Livermore National Laboratory paper prepared for the Department of State, Bureau of Politico-Military Affairs, Office of Weapons Non-Proliferation, 3 April 1992), pp. 1-4.

12. *MISSILE TECHNOLOGY CONTROL REGIME (MTCR)*: *Guidelines for Sensitive Missile-Relevant Transfers* (available from the Department of State, Bureau of Politico-Military Affairs, Office of Chemical and Biological Weapons, and Missile Non-Proliferation (PM/CBM), Washington, D.C., 7 January 1993).

13. Major Thomas D. Shearer, USAF, Department of State, Bureau of Politico-Military Affairs, Office of Weapons Non-Proliferation, Briefing titled: *The Missile Technology Control Regime*, January 1991, chart number 4. (Hereinafter known as: Shearer.)

14. U.S., White House Press Release, *Missile Technology Control Regime Announcement by the White House*, 16 April 1987.

15. Ibid.

16. Henry Sokolski, *Fighting Proliferation: The Role of Intelligence* (Consortium for the Study of Intelligence, Washington, D.C., 1993), p. 3. (Hereinafter known as: Sokolski, *Fighting Proliferation*.)

17. Ibid., pp. 7-8.

18. Ibid., p. 8.

19. Shearer, chart 15.

20. According to a footnote in the *Gulf War Air Power Survey*, the Scud missile was probably derived from the German V-2. The Scud was first observed in 1957 and deployed with Soviet ground forces beginning in the mid-1960's. Eliot A. Cohen et al., *Gulf War Air Power Survey*, Vol. II, Part II, *Effects and Effectiveness* (Washington, D.C.: U.S. Government Printing Office, 1993), p. 317, footnote 120.

21. Sokolski, *Fighting Proliferation*, p. 8.

22. Ibid., p. 11.

23. Brian G. Chow, *Emerging National Space Launch Programs - Economics and Safeguards*, Prepared for the Under Secretary of Defense for Policy (Santa Monica, CA: Rand Corporation, 1993), pp. v-vi. (Hereinafter known as: Chow, *Emerging National Space Launch Programs - Economics and Safeguards*.)

24. Martin Sieff, "Japan, South Korea Join Missile Race with North Korea," *The Washington Times*, 24 March 1994, p. A12. (Hereinafter known as: Sieff, "Japan, South Korea Join Missile Race with North Korea.")

25. Ibid.

26. According to David Fulghum and Jeffrey Lenorovitz, "The Jericho 2 intermediate-range missiles were fielded beginning in 1989 simultaneously with the 'creation of [Shavit missiles designed for] the conquest of space for military-applied purposes." They further indicate that the first two stages of the Shavit are the Jericho 2 missile. David A. Fulghum and Jeffrey M. Lenorovitz, "Israeli Missile Base Hidden in Hill," *Aviation Week & Space Technology*, 8 November 1993, p. 29.

27. According to David Mosher, of the Congressional Budget Office (CBO) National Security Division, the Army is developing the Theater High Altitude Area Defense (THAAD) to provide wide area defense against theater ballistic missile attack. U.S., Congressional Budget Office (CBO), CBO Staff Memorandum, *Theater Ballistic Missile Defenses: Selected Issues*, July 1993, p. 8. (Hereinafter known as: U.S., CBO Staff Memorandum, *Theater Ballistic Missile Defenses: Selected Issues*.)

28. Message, U.S., Department of State 374039, 131600Z Dec 93, Subject: Missile Technology Control Regime (MTCR) Plenary Press Release.

29. Sokolski, *Fighting Proliferation*, p. 11.

30. Ibid.

31. According to CIA Director James Woolsey, space launch vehicles, their components, technology, and production equipment are the same as used for long-range ballistic missiles. He states this is "the reason why Sputnik led to the concerns for the security of the United States back at the end of the 1950's. ... the technologies for ICBMs and space launch vehicles are very close -- in some cases virtually identical." U.S., Congress, Senate, *To Examine Nuclear, Biological, and Chemical Weapons Proliferation Threats of the 1990's*, p. 31.

32. Eliot A. Cohen et al., *Gulf War Air Power Survey*, Vol. II, Part I, *Operations* (Washington, D.C.: U.S. Government Printing Office, 1993), p. 180. (Hereinafter known as: Cohen, *Gulf War Air Power Survey*, *Operations*.)

33. Major Michael G. Cooper of the U.S. Marine Corps takes the position that, "... no single weapons system is an end unto itself (nuclear weapons of mass destruction are a possible exception). Likewise, few if any single events will be decisive. Rather, the cumulative impact of campaigns, events and strategy will determine the outcome of conflicts." Major Michael G. Cooper, U.S. Marine Corps, "The Iran-Iraq War and Lessons For The Future" (Newport, R.I.: Naval War College, 17 June 1989), p. 58. (Hereinafter known as: Cooper, "The Iran-Iraq War and Lessons For The Future.")

34. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), p. 69.

35. Ibid., pp. 77-78.

36. Ibid., p. 75.

37. Lynn Davis, the Under Secretary of State for International Affairs, indicates rogue states include countries such as Iran, Iraq, Libya, and North Korea. "Reforming Export Controls," *U.S. Department of State Dispatch*, Vol. 5, No. 15 (11 April 1994): p. 204.

38. How important are WMD systems to a potential adversary? As pointed out by Indian Air Commodore (Ret) Jasjit Singh, if Third World countries learned nothing else from the Gulf War, they learned not to war with the U.S. without unless they have their own nuclear weapons. Jasjit Singh, Indian Air Commodore (Ret), address to the School of Advanced Airpower Studies, Maxwell AFB, 7 October 1993.

39. According to Major Cooper of the U.S. Marine Corps, during the Iran-Iraq war both countries preferred countervalue targeting over counterforce. He further stated the logic for this choice "is that relatively limited costs can result in high gains. The effect on civilian and national morale can be great as can be the impact on the war fighting economy." Cooper, "The Iran-Iraq War and Lessons For The Future," p. 44.

40. Giulio Douhet, *The Command of the Air*, translated by Dino Ferrari (Washington, D.C.: U.S. Government Printing Office, 1983).

41. Irving L. Janis, *Air War and Emotional Stress* (Westport, Connecticut: Greenwood Press, 1951).

42. There is evidence that the Israelis adapted to the Scud attacks, which Navias suggests were "weapons of disruption," rather than "weapons of terror." However, the Israeli response might have been different if chemical warheads had increased the loss of life (Scuds directly killed 1 and injured 200). Public pressure might have forced reprisals, playing into Saddam's hands. Nevertheless, Navias states that "the effect of missiles on the Israeli populace should not be underestimated. ... missiles were undoubtedly regarded as more threatening than thunderstorms," (a reference to a statement made by General Schwarzkopf). Martin S. Navias, *Saddam's Scud War and Ballistic Missile Proliferation* (London: Brassey's, July 1991), pp. 25-26.

43. Cohen, *Gulf War Air Power Survey*, *Operations,* p. 179.

44. Ibid., p. 182. There was enough concern among U.S. leaders for the Gulf War Air Power Survey to note that, "worries in Washington concerning political and diplomatic fallout from the Scud attacks had been considerable from the beginning."

45. Ibid., p. 180.

46. According to David Young of Trimble Navigation, a company that makes GPS receivers, future manned and unmanned vehicles using as system known as "differential GPS" over long-ranges (hundreds of kilometers) will be able to obtain real-time navigation accuracy approaching meter and sub-meter levels even when the GPS code is broadcast in the coarse (scrambled) mode. In other words, as Steve Wooley of the Institute for Defense Analysis indicates, "Differential GPS allows the user to overcome the effects of selective availability (SA), the intentional degradation of the GPS signal. [A] world-wide differential service is plausible in 5-10 years." David Young, "GPS Based Navigation and Positioning: Modes of Operation, Accuracies and Applications" (Paper presented to the U.S. Department of State by Trimble Navigation, Ltd., Sunnyvale, CA, 2 October 1992); and, Steve Wooley, "Proliferation of Precision Navigation Technologies and Security Implications for the U.S." (Institute for Defense Analysis presentation to the Proliferation Countermeasures Working Group, 9 December 1991). (Hereinafter known as: Wooley, "Proliferation of Precision Navigation Technologies and Security Implications for the U.S.")

47. Morley Safer, *No Miss*, CBS News - 60 Minutes, 26 December 1993, p. 10. (Hereinafter known as: Safer, *No Miss*.)

48. Henry Sokolski, in an interview with 60 Minutes reporter Morley Safer, states that, "GPS companies were quick to realize the business potential for cheap systems that guide bombs and missiles to their targets. The Wall Street Journal reported that one American-owned Israeli company called Rokar has already sold a missile guidance system overseas. Company representatives didn't want to talk about it. ... Other companies are selling equipment overseas that corrects the military distortion of GPS. Magnavox representative Steve Duncomb says his company has sold that equipment all over the world, from China to the Middle East." Steve Wooley, from the Institute for Defense Analysis, lists the following countries as "actively trying to integrate GPS into missiles and unmanned air vehicles:" Pakistan, China, Burma, Israel, Iran, USSR, France, Germany. Safer, *No Miss*, p. 13; and, Wooley, "Proliferation of Precision Navigation Technologies and Security Implications for the U.S.," p.14.

49. Solid propellant missiles are of more military utility than liquid propellant missiles because their design and reduced support structure allows them greater pre-launch survivability and higher reliability. Further, they are more responsive to military use since there is no need to delay use for fueling the missile. CIA analyst, telephone interview with author, 18 May 1994.

50. U.S., Congress, House, Joint Hearing before the Subcommittees on Europe and the Middle East and International Security, International Organizations and Human Rights of the Committee on Foreign Affairs, *Iraq's Nuclear Weapons Capability and IAEA Inspections in Iraq*. 103rd Congress, 1st session, 29 June 1993, pp. 91-92. (Hereinafter known as: U.S., Congress, House, *Iraq's Nuclear Weapons Capability and IAEA Inspections in Iraq*.)

51. Alan Friedman, "The Flight of the Condor," *London Financial Times*, 21 November 1989, p. 10; (Hereinafter known as: Friedman, "The Flight of the Condor."); and, U.S., Congress, House, *Iraq's Nuclear Weapons Capability and IAEA Inspections in Iraq*, pp. 91-92.

52. Seth Carus indicates, rear area targets that are vulnerable to accurate long-range missiles include targets such as: equipment storage, support facilities, defense factories, radar sites, surface-to-air missile sites, repair facilities, fuel and ammunition depots, and command posts. U.S., Congress, House, *Iraq's Nuclear Weapons Capability and IAEA Inspections in Iraq*, pp. 91-92; and, Carus, *Ballistic Missiles in Modern Conflict*, p. 47.

53. Budiansky writes that the Pentagon claims a 52 percent success rate for the Patriot missiles in the Gulf War - revised down from the initial claims of a 100 percent success rate. Stephen Budiansky, "Playing Patriot Games," *U.S. News & World Report*, 22 November 1993, p. 16. (Hereinafter known as: Budiansky, "Playing Patriot Games.")

54. Thomas A. Stansell, from that portion of the Magnavox company that produces GPS receivers, notes, "The only difference between a receiver which has the differential GPS capability and one which does not is software. With differential software and a communications link to provide the correction messages, however, navigators can achieve accuracies of two to five meters ...." He goes on to say that these receivers are being freely marketed anywhere in the world with the full knowledge of, and without objection from, the U.S. Department of Defense. Thomas A. Stansell, Jr., "GPS Civil User Equipment Export Policy" (paper prepared for 1991 MTCR Interagency Working Group by Magnavox Advanced Products and Systems Company, Torrance, CA, undated), p. 6.

55. Cohen, *Gulf War Air Power Survey*, *Operations*, p. 191.

56. Safer, *No Miss*, p. 14.

57. Ibid.

58. U.S., Congress, House, *Iraq's Nuclear Weapons Capability and IAEA Inspections in Iraq*, p. 91.

59. U.S., Department of Defense, Defense Issues, *The Defense Counterproliferation Initiative Created*, pp. 1-2.

60. For example, when during Senate hearings Senator Glenn asked CIA Director Woolsey if he shared the view of his predecessor, Director Gates, in opposing U.S. exports of space-launched vehicles or advanced technology to both India and Pakistan because of the high probability that such technology would end up in a nuclear long-range ballistic missile program, Woolsey replied, "yes." Woolsey went on to explain that "space launch vehicles technology is very similar to and it's clearly applicable toward developing ballistic missiles. It is the reason why Sputnik led to the concerns for the security of the United States back at the end of the 1950's." Reference: U.S., Congress, Senate, *To Examine Nuclear, Biological, and Chemical Weapons Proliferation Threats of the 1990's*, p. 31.

61. Duncan Lennox, editor, *Jane's Strategic Weapon Systems*, (Surrey, United Kingdom: Jane's Information Group, 1990) JSWS Issue 07. (Hereinafter known as: Lennox, *Jane's Strategic Weapon Systems*.)

62. According to Brian Davis, on 15 April 1986 Libya launched two land-based SS-1 Scud B missiles at the U.S. Coast Guard station on the Italian island of Lampedusa. Although Qaddafi claimed to have destroyed the station, the missiles fell more than two miles short of the shoreline. However, the attack caused Italian military jets to scramble in search of any Libyan craft that might have fired the missiles. The result was that Italy found itself in a state of war alert for the first time since World War II. The 1986 reprisal Scud launches were a failure but they were not launched in error. The inaccurate Scud missiles of 1986 appear to be only a first step toward more lethal systems. This is seen in a 1991 Reuters report that quote Gaddafi as stating, in a reference to the 1986 U.S. bombing raids on Libya: "I only wish we had had missiles with a range of over 1,000 km (620 miles). Libya would never have been attacked by the Americans." Brian L. Davis, *Qaddafi, Terrorism and the Origins of the U.S. Attack on Libya* (New York: Praeger, 1990), p. 143; and, Dateline: Rome, *Reuter Library Report*, "Libya's Gaddafi Condemns Chemical, Germ and Nuclear Arms," 6 June 1991.

63. U.S., Congress, Senate, *To Examine Nuclear, Biological, and Chemical Weapons Proliferation Threats of the 1990's*, pp. 25-26.

64. JCSP 1-02 defines Intercontinental Ballistic Missile (ICBM) as having a range from 3,000-8,000 miles; Intermediate-Range Ballistic Missile (IRBM) as having a range from 1,500-3,000 miles; Medium-Range Ballistic Missile (MRBM) as having a range from 600-1,500 miles; Short-Range Ballistic Missile (SRBM) as having a range up to 600 miles. Martin, Sieff, "Japan, South Korea Join Missile Race with North Korea," *The Washington Times*, 24 March 1994, p. A12; (Hereinafter known as: Sieff, "Japan, South Korea Join Missile Race with North Korea."); and, JCS Publication 1-02 (Formerly JCS Pub 1), *U.S. Department of Defense Dictionary of Military and Associated Terms*, 1 December 1989, pp. 187, 188, 226, 235, 333.

65. Sieff, "Japan, South Korea Join Missile Race with North Korea."

66. Ibid.

67. Tony Horwitz, "A Terrorist Talks About Life, Warns of More Deaths," *Wall Street Journal*, 10 September 1990.

68. Thomas Sanction notes, "Iraq may already be secretly reviving its long-range missile program. Scientists continue to pursue ballistic-missile research, not only at sites destroyed during the war

and rebuilt, such as the Saad 16 research and development center neat Mosul, but in new facilities such as Ibn al-Haytham lab, constructed near Baghdad. While UN resolutions allow Iraq to build short-range rockets with a range under 93 miles, a UN expert notes 'the same technology used to make a missile that flies 93 miles can be used on one that flies 400 or 1,200 miles.'" Thomas Sanction, "No Longer Fenced In," *Time*, 23 May 1994, pp. 37-38. (Hereinafter known as: Sanction, "No Longer Fenced In.")

69. U.S., Congress, Senate, *To Examine Nuclear, Biological, and Chemical Weapons Proliferation Threats of the 1990's*, p. 31.

70. Arnold Engineering Development Center, Arnold Air Force Base, *Short-Range Ballistic Missile (SRBM) Infrastructure Requirements for Third World Countries*, September 1991, pp. 12, 170.

71. The GWAPS indicates, over the course of the Iran-Iraq war, Iraq "purchased a large number of Scuds from the Soviets ... [and] fired some 190 missiles [at Iran]." Additionally, according to Rolf Ekeus, chairman of the UN monitoring team of WMD after the Gulf War, Iraq bought a total of 890 Scud-B missiles from the Soviet Union during the 1970's and 1980's. Cohen, *Gulf War Air Power Survey*, *Operations*, p. 180; and, Sanction, "No Longer Fenced In," p. 37.

72. Friedman, "The Flight of the Condor," p. 10.

73. U.S., Congress, House, *Iraq's Nuclear Weapons Capability and IAEA Inspections in Iraq*, p. 91.

74. Alan Friedman, of the *London Financial Times*, reported in 1989 that, with the assistance of some Europeans, Iraq established the Consulting Engineering (Consen) firm in Europe to procure missile components and technology. Consen consisted of some 16 European subcontractors. In addition the Iraqis had numerous front companies throughout Europe to gain access to Western missile technology. Consen was the largest of a whole series of front companies established by Iraq to obtain NBC and missile, technology and components. Further, *Time* magazine reported that "According to congressional investigators, many front companies established in the late 1980's to purchase parts and technology for Saddam's weapons programs continue to operate in France, Switzerland, Germany, Britain and the U.S.". Friedman, "The Flight of the Condor," p. 10; and, Sanction, "No Longer Fenced In," p. 38.

75. An example of the successful non-military counter-proliferation campaign against the Condor missile is seen in the Helmy court case, where the Egypt Defense Minister attempted to buy carbon fiber and other missile equipment and technology, used in reentry vehicles and rocket motors from a U.S. citizen who worked at the U.S. Jet Propulsion Laboratory. Friedman, "The Flight of the Condor."

76. Ibid. Evidence of this activity by Iraq, and the difficulty in countering it, appears in a series of approved export licenses going to an Iraqi production site known as Saad 16. Further evidence arose in the statement of "a former U.S. official involved in the discussions between the Commerce and State Departments, Pentagon and the National Security Council [, who said] that the U.S. Government knew that Saad 16 was likely to do missile-related work."

77. Ibid.

PART II

ANALYSIS -- SECURITY INTERESTS - TO - MECHANISM - TO - ACTIONS

Part I of this thesis showed that the core problem of long-range missile proliferation is the possibility a hostile rogue state will use missiles to inflict high-leverage strategic harm against the U.S. This threat is of particular concern because of the possibility rogue states hostile to the U.S. will combine long-range missiles with NBC warheads. However, before we propose a response to the problem, we must go through a three step process. The first step is to determine what U.S. national security interests and objectives a counter-proliferation strategy must serve. With the desired objectives set, the second step will discuss the "mechanism" (i.e., the process) that leads to political change.[78] Finally, the third step presents six actions that can get the "mechanism" started. To begin our analysis, we start by reviewing U.S. security interests and objectives.

U.S. SECURITY INTERESTS & OBJECTIVES -- WHAT IS THE DESIRED OUTCOME?

American national security interests and objectives should be at the heart of any long-range missile counter-proliferation strategy. These interests and objectives establish the security requirements that determine the desired outcome of U.S. missile counter-proliferation policies. To establish this link, we must first identify U.S. national interests and objectives and then translating these interests and objectives into the form of a desired outcome.

The most current statement of U.S. national security interests and objectives is found in the *National Security Strategy of the United States*, published in January 1993.[79]

The document states there is only one vital U.S. national security interest -- the security of the continental U.S., its citizens, and its way of life.[80] In supporting this vital interest, the U.S. has many national security objectives: protecting U.S. citizens, access to resources and free markets, open international lines of communications, the spread of democracy, and the "global and regional stability which encourages peaceful change and progress."[81] This last objective includes the security of our friends and allies through collective defense arrangements against the proliferation of WMD and their missile delivery systems.[82] While the Clinton Administration will undoubtedly publish its own version of U.S. national security strategy, it's unlikely the vital security interests of the U.S. will change. However, we have already seen evidence of some reprioritizing of U.S. national security objectives. In a December 1993 speech, Defense Secretary Aspin set U.S. security priorities as 1) the global threat of WMD and long-range missile delivery systems; 2) the regional threat of aggression from rogue states; 3) threats to global democratic and market reforms; and 4) the need for a strong U.S. economy to support future defense needs.[83] This combination of U.S. national security interests and objectives forms the basis of any U.S. missile counter-proliferation strategy. The single desired outcome is to nullify the threat of missile proliferation to the U.S., its friends, and allies. In setting this desired outcome, the U.S. policymaker and warfighter must realize that unless some action is taken to counter ongoing missile proliferation, the continental U.S. is vulnerable to a Douhet-like missile attack. Such an attack is consistent with the employment strategy of rogue states. The U.S. is currently at risk from such a rogue state strategy because it has no coordinated response in place to defeat such an enemy strategy. With the desired political outcome now identified as the need to nullify a growing missile proliferation threat, we need to take the second step and determine a "mechanism" to achieve the desired outcome. Webster defines "mechanism" as "a process or technique for achieving a result."[84] Hence for our purposes the "mechanism" is the enabling process connecting the U.S. missile counter-proliferation response (or strategy) to the

desired outcome. This mechanism will then provide the direction necessary to guide an effective U.S. counter-proliferation strategy.

MISSILE COUNTER-PROLIFERATION -- THE NEEDED MECHANISM

It is unlikely that any single mechanism (i.e., process or method) will be completely effective in implementing a missile counter-proliferation strategy. Possible mechanisms that could nullify a growing missile threat include balance of power, balance of security, and balance of prestige measures. However, these mechanisms are difficult to quantify, difficult to trigger, and difficult to use in measuring success. Further, they are based on host-nation perceptions, and any changes in leadership can quickly change them and undo successful counter-proliferation gains. Because of the seriousness of the missile threat to do strategic harm, the U.S. needs a process to respond more directly to missile proliferation. To be most effective, this process should be all the things other mechanisms are not -- quantifiable, actionable, and measurable. The approach that best represents these attributes is the balance of cost mechanism.

A successful balance of cost mechanism works against missile proliferation at the operational and strategic levels of war by driving missile costs high and mission effectiveness low. The process works as follows. Reducing the quality and quantity of long-range missiles minimizes their ability to deliver payloads to a target. As the number and size of deliverable missile payloads delivered goes down, the cost effectiveness of missiles goes down as do their politico-military benefits. Thus, the key is to isolate those variables that cause a reduction in the cost effectiveness of delivering a missile payload. These variables either directly increase the cost of acquiring missiles or eliminate their military benefit by having the capability to destroy them before they reach their target. Further, analysis shows that by manipulating these variables the U.S. can make a rogue state missile program far more costly than one that invests in lethal aircraft. Therefore, if

a U.S. missile counter-proliferation strategy can control these variables to some degree, then the U.S. can push rogue state air power acquisition away from missiles and towards manned aircraft to meet its military needs. The following three cases show how the balance of cost mechanism can manipulate these variables. The first case shows the nominal comparison of missile and aircraft cost effectiveness. In the second case, the impact of maintaining the status quo in the fight against missile proliferation shows an improvement for the rogue state and encourages pursuit of missiles. Finally, the third case shows the potential influence of a strong counter-proliferation strategy that triggers the balance of cost mechanism and thus nullifies missile proliferation.

The nominal case begins with a cost effectiveness comparison between missiles and aircraft as shown in Table 1.[85] The values in the nominal case are an approximation of the values a rogue state could obtain in the mid-1980's and are comparable to those available to Iraq before the Gulf War. The case considers the aircraft infrastructure available in a rogue state to be a sunk cost, since most countries already have aircraft in place and will never rely solely on long-range missiles to meet their air power needs.[86] The Scud missile is the nominal long-range missile used in this comparison at an estimated cost of about $1 million per missile, which includes the cost of the missile and several year operations and support (O&S).[87] (However, the cost does not include the cost of launch infrastructure items such as launchers.[88]) The aircraft cost in the comparison is $40 million, including the cost of the pilot and several years of O&S. Pre-launch survivability is considered to be 100% in the nominal case for both missiles and aircraft. Using 100% pre-launch survivability for missiles is representative of the U.S. experience in the Gulf War where it appears that no mobile Scuds were destroyed on the ground.[89] For aircraft, 100% pre-launch survivability is generous and not representative of the Gulf War once Desert Storm began. However, since 100% is representative of the situation before the initiation of any hostilities it is the value for the nominal case. For reliability rates, the nominal case uses 80% for missiles and 95% for aircraft.[90] The

probability of penetration for missiles is their strongest military attribute and is assessed at 100% for the nominal case.[91] This was certainly the case on the eve of the Gulf War before testing the Patriot missile in battle.

NOMINAL PARAMETERS FOR MISSILE-AIRCRAFT COST- EFFECTIVENESS COMPARISON		
PARAMETERS	**BALLISTIC MISSILE**	**STRIKE AIRCRAFT**
PLS	**1.0**	**1.0**
R	**0.80**	**0.95**
PP	**1.0**	**0.95**
W	**1 ton**	**3 tons**
Tav = PLS*R*PP*W	**0.80 ton**	**2.7 tons**
C	**$1 M**	**$40 M**
L	**1.0**	**0.05**
CE = (C*L)/Tav (cost/delivered ton)	**$1.25 M per ton**	**$0.74 M per ton**

Table 1: Source *Assessing Ballistic Missile Proliferation and Its Control*, Center for International Security and Arms Control, Stanford University, November 1991, p. 46.

CE = (C*L)/Tav
CE = Cost Effectiveness measured in $Million per delivered ton of ordanance per sortie
C = delivery vehicle Cost
L = delivery vehicle Loss rate per sortie (1-PP) and,
Tav = PLS*R*PP*W = average number of Tons delivered per sortie
PLS = Pre-Launch Survivability
R = overall weapons system Reliability
PP = Probability to Penetrate defenses
W = average Weapons load per sortie at nominal range

Table 1A : Source *Assessing Ballistic Missile Proliferation and Its Control*, Center for International Security and Arms Control, Stanford University, November 1991, p. 46.

For aircraft, the nominal penetration value is 95% per sortie.[92] Finally, the Scud missile delivers one ton of weapons payload and this value represents the average weapons load per sortie at nominal range. The average weapons load for aircraft in the nominal case is three tons per sortie. This assumes a strike aircraft carries six tons of payload and a

second aircraft always joins the first to provide cover, thus resulting in an average payload per sortie of three tons.[93] Given these assumptions in the nominal case, we can draw the conclusion that the "greater payload-carrying capacity per sortie and the potential for multiple sorties make aircraft more cost effective ... even though they are considerably more costly to procure and support" than long range missiles.[94] Further, the cost effectiveness comparison shows rogue states could better attain their politico-military objectives by using aircraft over missiles. Using aircraft to meet their needs stretches third world defense dollars farther than missiles in the long-term and provides a higher potential of destroying opposition military targets. Hence, the result is the balance of cost mechanism places rogue states on the horns of a dilemma. As either rational or irrational actors, if they choose to pursue increasingly expensive and ineffective long-range missiles, they do so at the expense of their overall military posture. If their military posture is degraded they loose political effectiveness by pursuing long-range missiles. While this is true for the nominal case, further analysis reveals some interesting conclusions by slightly altering the variables. Before looking at how the manipulation of these variables can move the balance of cost mechanism to the advantage of the U.S., it is instructive to view the case where the U.S. takes no counter-proliferation actions and rogue states improve the quality of their long-range missiles.

In the second case, we assume the U.S. takes no new counter-proliferation actions. With this in mind, a sensitivity analysis of missile cost effectiveness variables shows it's possible to achieve significant reductions in the cost of deliverable payload with only minor adjustments. Under this scenario, long-range missiles are potentially competitive with aircraft in delivering weapons payloads. This is not to suggest that long-range missiles will replace manned aircraft. However, Table 2 shows rogue state long-range missiles can play a cost effective role at the operational and strategic levels of war if the U.S. takes no new counter-proliferation actions. As presented, the values used for long-range missiles are still more conservative than are technically feasible. For

example, a missile reliability rate of 80% compares very low to the near 100% values for present U.S. systems. Thus, with reliability rates of near 100% actually possible, it is not unreasonable to conclude that rogue states like Iraq, who have learned to operate Scud missiles and even modify Scuds into the Al Abbas missile, could attain reliability rates well above 80%. With this probability in mind, the status quo case uses a 95% figure to demonstrate undisturbed improvements in missile system quality. Simply upgrading missile reliability to 95% reduces the cost per ton of payload by $200,000. The result is a missile delivering its payload at $1.05 million per ton instead of the $1.25 million per deliverable ton in Table 1. Further, by increasing the average missile payload at nominal range from one ton to one and a half tons, the cost per ton of deliverable missile payload goes down by an additional $350, 000. This results in a final deliverable missile payload cost of $0.7 million per ton as shown in Table 2 -- this is $40,000 less than the average cost of deliverable aircraft weapons. Using an increased payload of one and a half tons is not unreasonable if countries are unimpeded in increasing system range and payload. Some Third World systems already have such payload capabilities. For example, the Saudi Arabian CSS-2 delivers a payload of 1.65 tons[95] Further, as officials at Lawrence Livermore Labs highlight, range-payload trade-offs are possible as rogue state experience with long-range missiles increases.[96] While the permutations are endless, the salient point is that long-range missile costs are sensitive to minor changes, and through concerted efforts rogue states can significantly improve the politico-military capabilities and cost-effective of their long-range missiles compared to aircraft. Hence, in the status quo case, rogue states looking to improve their politico-military effectiveness should make a decision to pursue long-range missiles to achieve their objectives. The political utility of long-range missiles increases as their cost effectiveness relative to aircraft increases. This is because the cost effectiveness relationship measures the ability of missiles to reach and destroy opposition targets. On the other hand, it is also apparent from the variables in this balance of cost mechanism that the sensitivity of these variables

allows the U.S. the opportunity to significantly increase the cost of missiles over aircraft costs and decrease the chances that a missile will reach its target. If this occurs the political utility of long-range missiles quickly erodes pushing the rational rogue state decision maker to move away from fielding long-range missiles. This point is demonstrated in the third case.

STATUS QUO PARAMETERS FOR MISSILE-AIRCRAFT COST- EFFECTIVENESS COMPARISON		
PARAMETERS	**BALLISTIC MISSILE**	**STRIKE AIRCRAFT**
PLS	**1.0**	**1.0**
R	**0.95**	**0.95**
PP	**1.0**	**0.95**
W	**1.5 tons**	**3 tons**
Tav = PLS*R*PP*W	**1.43 tons**	**2.7 tons**
C	**$1 M**	**$40 M**
L	**1.0**	**0.05**
CE = (C*L)/Tav (cost/delivered ton)	**$0.70 M per ton**	**$0.74 M per ton**

Table 2: Sensitivity analysis as modified by the author of this paper.

The third case represents the potential effectiveness of missile counter-proliferation efforts by the U.S. and its MTCR partners. Here modifying the variables increases the cost and decreases the military effectiveness of rogue state missile systems. Hence, a focused U.S. missile counter-proliferation strategy has the potential to have an impact on all the variables shown in Table 3. As previously indicated, no proof exists that U.S. air power destroyed any mobile Scud missiles during the Gulf War.[97] Here the

assumption is that with a modest effort the U.S. could lower enemy pre-launch survival to 95%. Case three also assumes the U.S. is able to force rogue states to use old technologies and poor materials by using the MTCR to deny the export of newer missile components and technology. The result is a combination of effects that yield low missile reliability. Consequently, by focusing on a strong counter-proliferation effort, the third case assumes the lowering of rogue state missile system reliability to a level of 75%. Additionally, the appearance of missile defenses like the Patriot begins to significantly decrease the benefit of the primary military attribute of long-range missiles -- penetrability. The Pentagon currently claims a 52% success rate for the Patriot in the Gulf War. This figure is actually good for a first generation ATBM primarily designed to counter an air-breathing threat, and undergoing its first real test during the Gulf War. Yet to remain conservative, case three assumes only a slight improvement in U.S. ATBM capabilities, reducing enemy penetration rates to 45%. Since case three assumes a U.S. ability to implement strong missile technology controls on variables such as missile payload, and since missile range is important at the operational and strategic levels of war, case three uses the Al Abbas as the nominal missile instead of the Scud. This substitution reduces deliverable payload from one ton to 0.35 tons.[98] Finally, case three assumes that future MTCR export controls drive the price of long-range missiles to $8 million apiece.[99] This increase in long-range missile cost is not unreasonable since the Al Abbas costs at least as much as the two Scuds it takes to make one Al Abbas, and the Scuds cost more than the $1 million per missile paid before the MTCR went into effect in 1987. Also, consider three examples of the high up front costs of missiles that increase per unit costs. First, Saudi Arabia spent $2 billion to purchase 30-50 CSS-2 missiles from China at a unit cost of some $20 million per missile.[100] Second, Iraq spent $5 billion to field the Condor missile and never received a single operational unit due to MTCR efforts.[101] Third, consider the still unsuccessful Brazilian attempts to-date to field a small SLV at a cost of approximately $1.1 billion.[102] Estimates are that this cost will

rise at least another billion dollars by simply maintaining tight MTCR export controls.[103] Therefore, an estimated increase of initial missile cost from $1 million to $8 million is not unreasonable. Table 3 shows the cumulative impact of these new values set for each of the nominal variables. By influencing the balance of cost mechanism, the cost per ton of delivered missile payload in case three increases some 30 times over the nominal case, to a total of $39.2 million per ton of deliverable payload. Note that this is the same as having each of the $40 million aircraft flying a one way mission. From Table 3 we can conclude that minor manipulations of missile cost effectiveness variables through missile counter-proliferation efforts, can significantly raise the cost per ton of delivered missile payload over the nominal case. Hence, by increasing the cost of missile acquisition and employment while significantly decreasing politico-military benefits, through lowered system reliability and ATBM systems, makes missile proliferation an unattractive alternative to fulfilling the politico-military desires of rogue states. Case three shows the U.S. can use the balance of cost mechanism to create the situation where rogue states are unwilling to make the large trade-offs from other politico-military goals to purse missile use. This is not to say that rogue states will base their decision solely on economic criteria. Indeed, while the balance of cost mechanism increases cost is also directly reduces the expected benefit of missiles as political weapons by removing their ability to reach any target. Decreasing missile pre-launch survivability, reliability, penetration, and average payload per sortie, to levels far below other alternatives to strike at the opposition undermines the political value of missiles as weapons, and can result in rogue states abandoning them. Meanwhile, the U.S. should augment the economic mechanism with politico-military mechanisms, using diplomatic, political, and informational tools to directly attack the politico-military incentives to pursue missiles. The politico-military processes include measures to counter balance of power, balance of security, and balance of prestige motivations for rogue states. The purpose of each of these supporting processes to nullify missile proliferation is to raise the economic, military, and political

costs of missile proliferation; keeping in mind that the economic process is the most actionable and measurable to redirect counter-proliferation efforts. Consequently, with the desired outcome identified as nullifying the threat of missile proliferation to the U.S., its friends, and allies, and the mechanism now identified as balance of cost, what remains is to identify those actions that trigger the balance of cost mechanism that yields the desired outcome. This thesis identifies six such actions for a U.S. missile counter-proliferation strategy to trigger the mechanism.

COUNTER-PROLIFERATION PARAMETERS FOR MISSILE-AIRCRAFT COST- EFFECTIVENESS COMPARISON		
PARAMETERS	**BALLISTIC MISSILE**	**STRIKE AIRCRAFT**
PLS	**0.95**	**1.0**
R	**0.75**	**0.95**
PP	**0.45**	**0.95**
W	**0.35 tons**	**3 tons**
Tav = PLS*R*PP*W	**0.11 tons**	**2.7 tons**
C	**$8 M**	**$40 M**
L	**0.55**	**0.05**
CE = (C*L)/Tav (cost/delivered ton)	**$39.2 M per ton**	**$0.74 M per ton**

Table 3: Sensitivity analysis as modified by the author of this paper.

SIX ACTIONS TO TRIGGER THE MECHANISM

With the mechanism identified as balance of cost, the third and final step is to identify those actions that convince a rogue state that missile proliferation is too costly. These six actions are to first slow missile proliferation, second to stop it, third to reverse it, fourth to deter it, fifth to defend against it, and sixth to offensively destroy it. A review of these six steps, their meaning, their purpose, the means to employ them, and some examples will lay the final ground work for a strategy of missile counter-proliferation. The first three actions are predominately non-military and the second three are military in nature.

The preventing or reversing of missile proliferation with non-military means is still the best way to nullify the missile threat.[104] Hence, the primary purpose of slowing, stopping, and reversing missile proliferation is to eliminate the threat through peaceful means. However, each action performs two additional roles. The first is to degrade the quality of what proliferation does occur. More specifically, to degrade rogue state missile reliability on the ground and in flight, to reduce missile weapons payload, and to increase missile costs. The second role is to buy time for the U.S. to develop military responses to ongoing missile proliferation.

The means to fulfill the above goals are diplomatic, political, and economic. Diplomatic means include bilateral and multilateral discussions to persuade countries to abandon their missiles of proliferation concern. The MTCR provides the U.S. a mandate and a multilateral forum to show rogue states the poor politico-military-economic cost-effectiveness of missile proliferation, from the growing cost of missiles to the loss of normalized relations with the West. Political means vary from isolation of rogue states on the world stage to unwanted publicity of their destabalizing missile programs. It also includes the process of holding foreign governments politically accountable for dual-use MTCR exports to a friendly country with missiles of proliferation concern. The process includes obtaining government-to-government missile technology assurances from friendly governments who pledge that dual-use U.S. exports won't surreptitiously end up

in missile end-uses.[105] Economic means include export oversight, safeguards, and denial. Additional handling and time delays are characteristic of oversight. Intrusive inspections are part of safeguards, while the outright denial of access to missile components and technology includes export controls and enforcement procedures. The reversal of the Egyptian and Argentine Condor missile is a successful example of U.S. and MTCR non-military counter-proliferation actions to slow, stop, and reverse missile proliferation. However, even in the case of the Condor missile, the United Nations (UN) Special Commission conducting inspections in Iraq indicates missile proliferation is continuing with the Iraqi Condor derivative known as the Badr 2000.[106] Continuation of the Badr 2000 shows missile proliferation is still likely to occur despite the best efforts of the U.S. to slow, stop, and reverse it. This leads to the fourth action designed to raise missile proliferation costs -- military deterrence.

Webster defines deterrence as the maintaining of vast military power and weaponry to discourage war.[107] In the case of missile proliferation, the purpose of deterrence focuses directly on inhibiting rogue state use of long-range missiles against the U.S. and its allies. Deterrence triggers the balance of cost mechanism by holding the entire enemy nation at risk for initiating a long-range missile attack against the U.S. and its friends.[108] There are two ways of gaining deterrence against an enemy's use of long-range missiles. The first is through defensive military force and the second is through offensive military force.[109] For defensive military means to be an effective deterrent, it somehow must cause the perpetrator of the offensive military action harm for their actions.[110] This is normally difficult to do. Yet, if ballistic missile defenses were capable of intercepting an enemy missile over its own territory, any NBC payload would actually harm the aggressor. In this situation, a defensive system would have a deterrent value against long-range missile use. However, deterrence is primarily attainable through the threat of offensive punishment and it need not necessarily be directed specifically at missiles themselves. If deterrence fails, depending on the severity of an enemy attack,

the resulting military punishment could range from counter-missile strikes to reprisal raids to all out war. If an enemy missile attack causes strategic harm to the U.S., a response of war is self explanatory. If an isolated missile launch against U.S. interests fails because of mechanical failure, or is blocked with defensive missiles, the U.S. offensive response could include strikes against those portions of a rogue state's missile infrastructure that can be located. To enhance deterrence, a counter-missile strike must be prompt, accurate, and preplanned. It could use U.S. long-range missiles with conventional warheads, to potentially include ICBMs. Thus, to deter rogue states from using long-range missiles, the U.S. must build a credible offensive and defensive force structure to counter missile proliferation. This leads to a fifth action designed to make missile use too costly -- missile defenses.

In defending against the threat of enemy long-range missiles, there are two requirements -- blocking an enemy missile attack at the operational (theater) level of war and at the strategic (global) level of war. In either case, the purpose of defensive missiles is to destroy enemy missiles in flight before they strike a would be target. Reducing the probability of missile penetration significantly reduces the cost effectiveness of missiles to a rogue state looking for a weapon to implement a Douhet-like strategy.

The means of providing missile defenses at the operational level of war include two layers of missile defense.[111] The first layer provides a lower-tier point defense for friendly fixed positions. The second layer provides upper-tier area defenses. Area defensive missiles are particularly important because these missiles not only protect fixed targets, as in the seaport docks at Dhahran in Saudi Arabia, but entire cities as well. Further, as previously indicated, in regions like the Middle East where nations are small and urban areas are a short flight away from enemy territory, area defense missiles can actually turn offensive missiles against those who launched them. If a rogue state launches missiles with NBC warheads, it risks the likelihood that they will land directly on itself. Hence, area defensive missiles have the potential to block enemy missiles and

become, in a sense, an offensive force. Unfortunately, at the operational level of war the U.S. currently has only a limited defensive missile capability in the form of the Patriot ATBM. A exists for improvements in the first layer of point missile defense and the deployment of a second layer of area missile defense.

At the strategic level of war, the U.S. could provide a third layer of missile defense. However, with the dismantling of the Strategic Defense Initiative, the U.S. has no current or projected plans to provide a strategic layer of defense for at least the next 10 years.[112] Given the 1993 CIA testimony that the U.S. military has at best 8 to 15 years to prepare a counter-proliferation response against rogue state ICBMs, and the 1994 appearance of the North Korean TD-2, with its potential ICBM range, any hope of fielding a timely national missile defense system is quickly passing.[113] Without missile defenses against an ICBM threat, the only U.S. recourse is to use the same U.S. offensive counter-missile force that can claim no confirmed mobile missile kills in the Gulf War.[114] Yet, despite the apparent failure of offensive air operations against Scud missiles in the Gulf War, the use of offensive military force to counter missile proliferation is our sixth option.

The overall purpose of an offensive military capability against long-range missiles is to eliminate them if there is no other way to protect American interests at home or abroad. However, there are also four secondary reasons for using offensive force to neutralize enemy missiles. First, one can use of a offensive counter-missile strike capability to act as a deterrent against enemy use of long-range missiles. Second, the U.S. can deploy a preemption capability to destroy rogue state long-range missiles before they pose an imminent danger to U.S. interests. Third, the U.S. can field a counter-missile capability as an instrument of reprisal, in the event of an isolated enemy missile launch. Finally, an offensive counter-missile capability can give the U.S. a broad offensive strike capability against fielded missiles in a general war like Desert Storm. In all cases, a strong counter-missile offensive capability raises an opponents costs by

significantly lowering the pre-launch survivability of his missiles. If effective, this capability has the potential of lowering rogue state pre-launch survivability far below the notional figure of 5% used in Table 3. However, the U.S. currently lacks the integrated offensive system capability of putting an enemy's long-range missiles at risk, as graphically shown in the failure to destroy Scuds in the Gulf War.[115] We need such a capability to promptly respond to the rogue state long-range missile threat, and to add coercive teeth to the non-military actions of slowing, stopping and reversing missile proliferation.[116] As Defense Secretary Aspin pointed out, the latter method is still the preferred solution to the missile proliferation threat facing the U.S. in 1994.[117]

In completing this examination of the six actions available to raise the political, military, and economic costs of missile proliferation, it is possible to draw two conclusions. First, all six actions, the three non-military actions of slowing, stopping, and reversing missile proliferation, and the three military actions of deterring, defending against, and destroying the employment of rogue state long-range missiles, play a role in missile counter-proliferation efforts. However, while all six actions play a role in the war on missile proliferation, three of them are the heart of a strong U.S. counter-proliferation strategy -- slowing, defending against, and destroying long-range missiles of proliferation concern. These actions trigger balance of cost calculations by opponents and help nullify the missile proliferation threat against the U.S., its friends, and its allies.

PART II -- INTERIM SUMMARY

Part II of this thesis assumes that despite the best efforts of the U.S. and its MTCR partners to prevent missile proliferation, it is still likely to occur. In response to this threat, the U.S. must take a more aggressive stand against long-range missiles of proliferation concern and adopt a coordinated counter-proliferation strategy. Part II began by showing that the one vital security interest of the U.S. is to protect American

territory, lives, and way of life. This interest means nullifying the threat of missile proliferation to the U.S., its friends, and allies. The balance of cost mechanism is the best way to achieve U.S. objectives because it increases the cost of missile proliferation to rogue states and simultaneously lowers any benefits missile systems provide (by significantly lowering their ability to reach a target on friendly soil). Lastly, this section concluded that of the six possible actions U.S. decision makers and warfighters have available, they have the most control over three of these actions. They focus on slowing missile proliferation, developing missile defenses, and destroying missiles of proliferation concern, if necessary. If these actions are applied individually they will have little likelihood of success. However, if they are coordinated into a meaningful three-pronged U.S. counter-missile proliferation strategy, they have a reasonable chance of nullifying the missile threat to the U.S. its friends and its allies. This conclusion leads to the final part of this thesis -- considering how to apply a three-pronged strategy, at an affordable level of risk, to nullify the current missile proliferation problem.

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78. The identification of the "mechanism" as an integral part of the process to connect strategy to desired outcome is taught by Dr. Robert A. Pape, Jr., at the Air Force School of Advanced Airpower Studies during 1993 at Air University, Maxwell AFB. Robert A. Pape, Jr., *Punishment and Denial: The Coercive Use of Airpower* (Ithaca, NY: Cornell University Press, forthcoming).

79. *National Security Strategy of the United States, January 1993* (Washington, D.C.: U.S. Government Printing Office, 1993). (Hereinafter known as: *National Security Strategy of the United States, January 1993*.)

80. Ibid., p. 3.

81. Ibid.

82. Ibid., pp. 3, 16.

83. U.S., Department of Defense, Defense Issues, *The Defense Counterproliferation Initiative Created*, p. 1.

84. *Webster's New Collegiate Dictionary*, (Springfield, Massachusetts: G. & C. Merriam Company, 1979), p. 707. (Hereinafter known as: *Webster's New Collegiate Dictionary*.)

85. This table is drawn from, Harvey and Rubin, *Assessing Ballistic Missile Proliferation and Its Control*, p. 46.

86. Ibid., p. 45.

87. Ibid.

88. Ibid.

89. The *Gulf War Air Power Survey* notes, "Of all the aspects in the air campaign, the effectiveness of air operations in suppressing Iraq's Scud missiles remains the most unclear." As one recent report indicates well after the war: 'To date, we have yet to confirm an Iraqi mobile SRBM [Short-range ballistic missile] launcher kill resulting from U.S. aircraft attacks ...." Cohen, *Gulf War Air Power Survey*, *Operations*, p. 179.

90. Harvey and Rubin, *Assessing Ballistic Missile Proliferation and Its Control*, p. 45.

91. Ibid.

92. Ibid.

93. Ibid.

94. Ibid., p. 46.

95. Lennox, *Jane's Strategic Weapon Systems*.

96. In the foreseeable future rogue states will gain an ability to modify long-range missiles to accommodate range-payload trade-offs as they gain experience with long-range missiles (e.g., Iraq modifying Scuds into Al Abbas missiles).

97. Cohen, *Gulf War Air Power Survey*, *Operations*, p. 179.

98. Lennox, *Jane's Strategic Weapon Systems*.

99. A cost of $8 million per missile may actually be very low in the 1990's, as a result of the successes of the MTCR to raise the political, military, and economic cost of long-range missiles. For example, consider the sale of CSS-2 missiles by the Chinese to Saudi Arabia. According to *Assessing Ballistic Missile Proliferation and Its Control*, Saudi Arabia purchased 30-50 missiles for $2 billion. If Saudi Arabia had received 250 missiles for the same $2 billion the cost would be $8 million per missile. Balance this with the $1 million per missile cost used in the nominal case. It is assumed that the $1 million is the cost of Scuds when they were obtained in the early 1980's for use in the Iran-Iraq war and that the price has risen since that time. Reference: Harvey and Rubin, *Assessing Ballistic Missile Proliferation and Its Control*, pp. 45, 60.

100. Ibid., p. 60.

101. Friedman, "The Flight of the Condor," p. 10.

102. Robert Usher and Donald Blersch, *Decision Maker's Guide to International Space* (Arlington, Virginia: Analytic Services Inc., 1993), p. 21.

103. Chow, *Emerging National Space Launch Programs - Economics and Safeguards*, p. vii.

104. The emphasis in missile proliferation has in the past been on non-proliferation. Non-proliferation in this context means the prevention of missile proliferation. Defense Secretary Aspin summarized that "the policy of non-proliferation combines global diplomacy and regional security efforts with the denial of material and know-how to would-be proliferators." Secretary Aspin considers prevention of proliferation of WMD and its missile delivery systems as "our preeminent goal." U.S., Department of Defense, Defense Issues, *The Defense Counterproliferation Initiative Created*, p. 2.

105. U.S. MTCR Government-to-Government assurances is a formalized process that occurs through the State Department on a Case-by-Case basis to allow the export of dual-use articles that might otherwise be denied. The decision to condition MTCR exports on Government-to-Government assurances is made in the interagency Missile Technology Export Control (MTEC) Group, chaired by the Department of State, Bureau of Politico-Military Affairs.

106. U.S., Congress, House, *Iraq's Nuclear Weapons Capability and IAEA Inspections in Iraq*, pp. 91-92.

107. *Webster's New Collegiate Dictionary*, p. 307.

108. Thomas C. Schelling, *Arms and Influence* (New Haven and London: Yale University Press, 1966).

109. Ibid., pp. 78-80. "Compellent threats can try to induce more affirmative action, including the exercise of authority by an enemy to bring about the desired results. War itself, then, can have deterrent or compellent intent, just as it can have defensive or offensive aims."

110. Ibid. "The observation that deterrent threats are often passive, while compellent threats often have to be active, should not be pressed too far. Sometimes a deterrent threat cannot be made credible in advance, and the threat has to be made lively when the prohibited action is undertaken. This is where defense and deterrence may merge, forcible defense being undertaken in the hope, perhaps with the main purpose, of demonstrating by resistance that the conquest will be costly, even if successful, too costly to be worth while."

111. Ballistic Missile Defense Organization, *Advanced Planning Briefing for Industry* (The Ritz-Carlton, Tysons Corner, VA, Meeting #494, 1-2 March 1994), pp. 128-160. (Hereinafter known as: Ballistic Missile Defense Organization, *Advanced Planning Briefing for Industry*.)

112. According to *The Eagle*, the Secretary of Defense's Bottom-Up Review includes a major shift in ballistic missile defense emphasis from National Missile Defense (NMD) to Theater Missile Defense. It is reported that NMD will become a technology development program with no actual deployment anticipated over the next ten years. Further, this shift eliminates the urgency to resolve ABM Treaty issues for multiple NMD sites and the use of space-based sensors has decreased. "ABM Treaty Get Narrow Reading," *The Eagle* (News for the U.S. Army Space and Strategic Defense Command), 17 December 1993, p. 3. (Hereinafter known as: "ABM Treaty Get Narrow Reading," *The Eagle*.)

113. U.S., Congress, Senate, *To Examine Nuclear, Biological, and Chemical Weapons Proliferation Threats of the 1990's*, pp. 25, 26; and, Sieff, "Japan, South Korea Join Missile Race with North Korea," p. A12.

114. Cohen, *Gulf War Air Power Survey*, *Operations*, p. 179.

115. Actions taken during the Gulf War to counter Scud attacks were in many respects an after-thought, as demonstrated by the fact that "Key portions of the target set-notably the presurveyed launch sites and hiding places used by the mobile launchers-were not identified before 17 January 1991." Thomas

A. Keaney and Eliot A. Cohen, *Gulf War Air Power Survey Summary Report* (Washington, D.C.: U.S. Government Printing Office, 1993), p. 83.

116. Ibid., p. 79. "Overall, the United States did not fully understand the target arrays comprising Iraqi nuclear, biological, chemical, and ballistic missile capabilities before the Gulf War."

117. U.S., Department of Defense, Defense Issues, *The Defense Counterproliferation Initiative Created*.

PART III

SOLUTION -- LOW RISK THREE-PRONGED MISSILE PROLIFERATION STRATEGY

Part I of this thesis outlined the problem of long-range missile proliferation facing today's U.S. policymakers and warfighters. Part II then proposed a possible solution to the problem. It linked U.S. national security interests and objectives to nullifying the threat of missile proliferation to the U.S., its friends, and its allies. The solution to the threat centered on increasing the cost and decreasing the benefits of missile proliferation through six political, economic, and military actions. Of the six actions, three remain within the control of U.S. policymakers and warfighters, and thus form the core of a three-pronged U.S. counter-missile strategy. Part III of this thesis will now recommend how to apply this strategy and providing a low risk of long-range missile attack to the American people. The recommendation requires stronger non-military political and economic actions than the U.S. has traditionally used in the past. However, the three pronged strategy also requires a stronger U.S. military response to missile proliferation, including the deployment of a three-layered missile defense system and offensive counter-missile capabilities designed to destroy enemy long-range missiles. To fleshout this strategy, Part III first looks at three options designed to thwart missile proliferation and selects the option with the lowest risk to the American people.

THREE COUNTER-PROLIFERATION OPTIONS

In using a three-pronged counter missile proliferation strategy, there are three possible options: high risk-low cost, a medium risk-medium cost, and a low risk-high cost. If we assess our strategic options by using the relative values of low, medium, or high, we can shape the future and head-off long-range missile proliferation threats before

facing missiles on the battlefield, or suffering strikes on U.S. (or MTCR member's) population centers.

The first response option to consider is high risk-low cost. This option applies the three-pronged counter-proliferation strategy by using non-military politico-economic means to slow missile proliferation, using missile defenses to block enemy missile employment, and using offensive military capabilities to destroy missile proliferation, if necessary. Non-military MTCR-based coercion dominates the high risk-low cost option with the military playing a supporting role in counter-proliferation actions. The desired outcome is to nullify the missile proliferation threat by sufficiently slowing the progress of a rogue state missile program until costs become prohibitive. For the U.S. to maintain low costs in reaching this desired outcome, it must slow ongoing proliferation activities without building improved missile defenses or an offensive counter-missile capability. However, the history of missile proliferation since 1980 shows that without strong military counter-missile capabilities U.S. efforts to nullify rogue state missile proliferation fail to provide a credible U.S. military coercive threat to stop missile proliferation. Non-military actions can include political-diplomatic pressure to isolate rogue states by exposing their missile proliferation to the UN and regional neighbors. Further, economic pressures include the blocking of world bank loans, blocking of world economic aid, economic export controls, embargoes, and tariffs. Military pressures include constraining military-to-military ties and security assistance with rogue states, and assisting the military forces of their neighbors. Additionally, the low cost option calls for a minimal long-range missile defense effort limited to a slow improvement of the Patriot point defense missile. This option provides minimal research into theater area missile defense and national missile defense, with no plans to deploy either. Lastly, the high risk-low cost option limits offensive capabilities against missile threats to the systems and procedures used in the Gulf War. Offensively no special equipment is acquired, no contingency planning performed, and the response to missile attack is

generally limited to assaulting non-missile related systems. Although the high risk-low cost option worked in eliminating the Argentine Condor missile,[118] it presents the highest risk of harm to U.S. citizens and their property. The option leaves the country unprepared to deal with the contingency of long-range missile employment, specifically because of its low cost. Under this option, the warfighter provides no missile defenses for the continental U.S., minimal defenses for fielded forces, and no offensive capabilities to directly respond to enemy missile employment. The high risk-low cost option represents the status quo and although it may occasionally succeed, the Gulf War shows it can fail catastrophically and then recovery is at great cost. An alternative to this approach is the second response option of medium risk at medium cost.

Under the medium risk-medium cost counter-proliferation option there exists a balance of non-military and military actions and the U.S. military plays a partnership role in those actions. This even mix of non-military and military actions first uses the full range of non-military, MTCR-based actions already described. In addition, the medium risk-medium cost option adds the fielding of a theater area missile defense system to the point defense system, while maintaining a research effort to counter future rogue state ICBMs. Lastly, the medium risk-medium cost option actively builds on current offensive military capabilities such as the F-117 and F-15E by combining current Defense Support Program (DSP) satellite intelligence with information from the Director of Central Intelligence (DCI) Non-Proliferation Center (NPC) to conduct military contingency planning and exercises against rogue state use of long-range missiles.[119] In this way, the military builds reactive missile defenses and an offensive reprisal capability to raise the cost to the enemy and lower his benefits but it also enhances deterrence against long-range missile use. This deterrence takes two forms: regional theater missile defense to parry any offensive long-range missile attack and the demonstrated capability to respond to such an offensive strike and destroy the threat. Support of this option may include

multinational (and salutatory) long-range missile destruction exercises using a combination of current manned and unmanned systems in the demonstration.

In a medium risk-medium cost scenario, the U.S. response increases in cost due to improving counter-missile defensive and offensive capabilities. At the same time they greatly lower the potential risk of missile attacks on U.S. forces, friends, and allies. The strength of the medium risk-medium cost option is that it forces rogue states to consider the costs and benefits of missile proliferation in the face of a U.S. (and Western) military response, should they employ long-range missiles. With theater area missile defense, this option also gives the U.S. the regional ability to allow the rogue state to make the initial long-range missile attack without suffering strategic harm. However, the medium risk-medium cost option does not defend the continental U.S. against long-range missile attack. Thus, the best it can provide is lower regional risk to forward deployed U.S. forces leaving the population of the U.S. subject to direct missile coercion. Yet, the lower initial dollar cost associated with such a risk might make this option acceptable to some (as compared to a low risk-high cost option). This brings us to the last option, low risk to the American people at a relatively high cost.

In a low risk-high cost response option, the desired outcome of nullifying a missile threat relies heavily on military actions to trigger an opponent's cost-risk calculations. The intent is to attack those factors with the most direct impact on rising enemy missile costs and lowering expected missile benefits. Thus, the focus is to significantly reduce penetrability of enemy missiles and reduce pre-launch survivability. In this option, the military plays a leading role in both non-lethal and lethal coercion. Non-military actions include all of those in the high risk-low cost option. However, the low risk-high cost option extends the military actions of the medium risk-medium cost option in two ways. First, it upgrades and deploys missile point defenses, theater area defenses, and national missile defenses into a three-tiered system. This system consists of lower-tiered point defenses, upper-tier area defenses, and a U.S. national missile

defense system. To this end, the fielding of ERINT is scheduled for 1998, THAAD is scheduled for 2001, and the fielding of a national missile defense is set for 2003-2006 (to counter the threat of rogue state ICBM-SLV systems). Second, the low risk-high cost option calls for the fielding of an offensive military capability to find and destroy enemy long-range missiles. Yet, the capability to find enemy missiles requires improving the integration of intelligence information with warfighting contingency planning. It also requires the fielding of a U.S. space-based detection and targeting system linked to conventional precision manned and unmanned systems, thus providing a prompt capability to destroy missiles threatening the U.S. continent.[120] Enhancing offensive prompt response capabilities also includes the long-term acceptance of conventional space-based weapons to destroy rogue state missiles threatening the U.S.

As current systems are modified and future systems acquired, they should be exercised to demonstrate our deterrent resolve. For example, tests might include the launching of conventional U.S. ICBMs against test-range targets to demonstrate our capability and resolve on the issue of long-range missile proliferation. Significantly, the target of these actions is not just the rogue states politico-military leadership, but its long-range missile capabilities as well. Such a move would, for example, put the North Koreans on notice that the U.S. was responding to their intercontinental long-range missile threat with a specific set of responses.[121] The two strengths of the low risk-high cost option are its full three layers of missile defense (including ICBM-SLV defenses) and a strong offensive reprisal or preemptive capability. The greatest weakness in this option is its higher cost. However, it is possible the higher cost, over the medium risk-medium cost option, is not as much as one might think. To provide a national-level missile defense against rogue states may be possible by increasing projected funding from $400 million per year from fiscal year (FY) 1995 through FY1999 (for the medium risk-medium cost option) to $600 million and by then adding $8 billion to build, deploy, and support (for ten years) a national missile defense system of one site supported by

Brilliant Eyes by 2004.[122] This results in a projected national missile defense cost against limited rogue state attacks for about $9-11 billion. Add to this $300 million for continuing research into a regional-level defensive boost phase interceptor and by the turn of the century the U.S. would possess a strong defensive system against rogue states at the regional and national levels (operational and strategic levels of war). This would provide the capability to respond to growth in the enemy threat and a strong deterrent against missile proliferation. While no cost figures are available for upgrading offensive systems under a low risk-high cost option, it is expected that these costs would be well below the cost of building and deploying defensive systems, until the U.S. is ready to make the policy decision to move forward with a space based conventional weapon to respond to the threat. Thus, in considering the relative risk and cost factors, our three options run from high risk-low cost to low risk-high cost, which brings us to select the best option.

In recommending the implementation of a U.S. missile counter-proliferation strategy, the risk level selected relies on the answer to three questions. First, how credible is the threat of rogue state long-range missile employment? Part I of this thesis indicates missile proliferation continues on despite U.S. preventive efforts. The direction of missile proliferation among rogue states is for systems of increasing military lethality at the operational and strategic levels of war, including missiles capable of reaching the U.S. continent potentially as early as 2001. Further, as seen in the Gulf War, once rogue states acquire missiles they have demonstrated the will to use them to strike at U.S. forces. Even conventional long-range missiles with WMD potential can cause high-level strategic harm to U.S. objectives. Therefore, the conclusion that there is a threat of direct and indirect strategic harm to the U.S. is real.

Secondly, how vital is the national interest of protecting the territory and people of the U.S. from foreign high-leverage or strategic harm? It is clear from the *National Security Strategy of the United States*, that the one vital national security interest we have

is the security of U.S. territory, its people, and its way of life.[123] Moreover, since long-range missiles capable of delivering NBC payloads clearly threaten U.S. national security with catastrophic damage, the U.S. must respond. This brings us to the third question.

Of our three risk-cost options, which will best nullify the missile proliferation threat facing the U.S. at an affordable cost? The best choice is the three-pronged strategy presented in the low risk-high cost option, since it is best able to reduce the risk of catastrophic strategic harm to U.S. national interests and the only option that proposes a military defense to protect the continental U.S. from missile attack. What remains is to discuss how to implement the three-pronged strategy of the low risk-high cost option.

NON-MILITARY ACTIONS DESIGNED TO STEM MISSILE PROLIFERATION

The proposed non-military actions to slow missile proliferation fall into two groups. The first group involves solidifying the MTCR as the international standard against missile proliferation and improving enforcement of the MTCR. The second group centers on internal U.S. actions taken to support the MTCR and slow missile proliferation. These internal U.S. actions include setting stronger proliferation export controls and better integrating the interagency efforts of the policymaker, warfighter, and intelligence analyst in applying U.S. export controls.[124] Let us now look at some of these measures in greater detail.

The first action to slow the spread of missiles is to enhance the standing of the MTCR as the international standard for missile non-proliferation.[125] There are two ways of accomplishing this: clearly define what are the MTCR standards, and send clear diplomatic signals that the MTCR is the foundation for missile non-proliferation.[126] In terms of standards, the MTCR prohibits transfers by member nations of Category I missiles (i.e., those missiles capable of delivering 500 kg to a range of 300 km) or of missile components supporting Category I missiles.[127] The standard also requires the

export denial of MTCR Category II missiles (i.e., missiles capable of delivering any payload to 300 km) if information indicates these long-range missiles are for NBC payloads.[128] Second, every diplomatic opportunity must be taken to demonstrate U.S. concern with the proliferation of WMD and its missile delivery systems. President Clinton recently included this as a major U.S. initiative, stating that "Our national security requires us to accord higher priority to non-proliferation and to make it an integral element in our relations with other countries.[129] In this vein the U.S. should help make the MTCR the international non-proliferation standard by using it as a tool in the United Nations (UN) to expose those countries fielding dangerous long-range missiles, such as North Korea.[130] Indeed, in response to North Korea's development of the TD-2, the MTCR countries should make the case before the UN that this threatening missile, and its potential NBC capability, should invite UN sanctions in the name of the MTCR and the other non-proliferation regimes.[131] Such sanctions would strengthen the MTCR as the international norm and possibly result in a slowing of missile proliferation.[132]

Adopting MTCR non-proliferation standards and sending clear diplomatic signals that the MTCR is the ultimate non-proliferation authority, solidifies the MTCR's position as the international bulwark against missile proliferation. The two steps would also increase the cost of missile components and lower their expected political benefits. The results come from a stronger MTCR front against rogue nations looking for cracks in the MTCR's export controls. With a strong international standard set the next non-military MTCR action to slow missile proliferation is strong enforcement of those standards.

The second MTCR action to slow missile proliferation is implementing stronger multinational enforcement of MTCR export controls. There are three ways to enhance enforcement to slow missile proliferation. First we can strengthen MTCR export standardization among its members. The MTCR countries should set up an internal working group to standardize the approval and denial of exports to non-MTCR countries. The working group should ensure MTCR export controls are interpreted equally among

the partner nations. Further, this group should focus on protecting missile technology and components, particularly dual-use components, from bad end-uses in rogue states. This "leveling of the playing field" among the MTCR partners would eliminate competitive advantages that might exist if some nations do not enforce the MTCR controls as rigorously as do other partners. It would also prevent rogue states from playing one MTCR member against another, and thus ensuring the enforcement of MTCR standards over suspect exports.

The second way to implement stronger enforcement of MTCR export controls is for the U.S. to politically push MTCR members to establish stronger internal and external penalties for "persons" guilty of transferring MTCR controlled items.[133] Internal penalties are those penalties on a countries own nationals regardless of whether they operate from within or outside the boundaries of their home nation. External penalties are those applied to "persons" outside the boundaries of an MTCR nation that are not nationals of the MTCR country. In the area of external penalties the U.S. needs to politically encourage MTCR countries to adopt missile sanctions legislation against non-MTCR countries similar to the U.S. enhanced proliferation control initiative (EPCI).[134] Under this proposal, MTCR nations should enact their own national "missile sanctions legislation" to penalize foreign (and domestic) "persons" in non-MTCR countries (and their own country) transferring MTCR missiles, technology, or components, to non-MTCR missiles of proliferation concern. For instance, if France found an Iraqi "person" buying Scud missiles from a North Korean company, the French government would prohibit French firms from dealing with either the Iraq or North Korean "persons" involved for two years. This approach is more effective than standard penalties because missile sanctions focus the penalty on rogue state "persons" pursuing missile proliferation.

The third way of implementing stronger enforcement of MTCR controls is to use technical experts from the MTCR. They would conduct inspections (some under the

auspices of the UN) to verify that exports, particularly dual-use items, are not being transferred to missile programs. (Creating an MTCR inspection team requires the consensus of its 25 members, but such a broad base show of presence might discourage missile proliferation.) Consequently, a periodic MTCR team may go to Brazil and verify MTCR items destined for its commercial aircraft industries are not really going to their SLV program. If this team discovers violations, they could lead to higher missile acquisition costs, restrictions on legitimate trade, or missile sanctions. Conversely, if there are no violations, an inspection acts as a confidence building measure and result in more open trade with MTCR countries. Ultimately, each of the MTCR countries must search for more effective ways to individually slow missile proliferation. In the case of the U.S., two non-military actions are appropriate.

The first non-military action the U.S. can take to slow missile proliferation is to put national security interests over commercial gain when it comes to MTCR technology and equipment (including dual-use technologies and equipment).[135] To formalize this priority the National Security Council (NSC) should explicitly place the decision authority for all MTCR related exports, including Department of Commerce dual-use articles, in the hands of a single U.S. government agency. Because these MTCR export controls involve foreign policy and national security controls, the designated agency should be the Department of State. By placing decision authority in the Department of State, the U.S. government would make a choice. It would choose security over profit, it would control sensitive U.S. goods and services that directly and indirectly contribute to missile proliferation. However, although the Department of State would be the responsible U.S. agent for MTCR controls, the Department of Defense, the Arms Control Disarmament Agency (ACDA), and the Commerce Department would be voting members in export decisions.[136] If there was a policy disagreement, the NSC would resolve the problem.

The single agency approach has several advantages. It would speed export licensing decisions. It would also avoid the current situation where the Department of Commerce is often defacto setting U.S. counter-proliferation policy by exporting goods and services over the objections, or without the knowledge, of the Departments of Defense, State, and ACDA. In implementing the single agency solution, it would be clear that on foreign policy-national security grounds the State Department would have access to all export licenses in the Commerce Department. Providing interagency access to dual-use export licenses would assure tighter national security export controls and would avoid the problem of the Commerce Department blocking State Department and Defense Department access to information on exports. It would also potentially prevent situations where U.S. dual-use exports might go to support known missile programs.[137] However, the need for stronger U.S. export controls leads to a second recommendation -- closer ties between the policymaker, the warfighter, and the intelligence community.

Sorting out proper and improper export controls requires the joint efforts of the policymaker, the warfighter, and the intelligence community. In 1992 the intelligence community took a giant step forward in focusing on the spread of WMD and their missile delivery systems when it established the Director of Central Intelligence (DCI) Nonproliferation Center (NPC) to support the policymaker and warfighter.[138] Since its inception the NPC has steadily improved its support to the two U.S. interagency working groups monitoring missile proliferation.[139] These two counter-missile groups are the Missile Technology Export Control (MTEC) group and the Missile Trade Analysis Group (MTAG).[140] However, the NPC must do more to support U.S. policymakers and warfighters. To be effective in controlling missile proliferation, the need goes beyond raw intelligence to a synthesis of all available information and predicting the status of rogue state missile programs (all without actually becoming part of policymaking).[141] Knowing the status of these programs supports proactive internal and external attempts to block MTCR exports. Within this context, the NPC (with the participation of

policymakers and warfighters) should establish a working database of U.S. missile exports to assist the interagency process combating long-range missile proliferation. With a database in place the policymaker and warfighter will be more effective in using non-military tools to slow, stop, and reverse missile proliferation.

This completes our low risk-high cost review of non-military actions to counter missile proliferation. Each of the actions attempts to slow missile proliferation by political and economic means based on the MTCR. Further, the actions deny rogue states the missile technologies they need to improve their missile systems. The denial could convince rogue states that missile proliferation is not worth the high cost, in terms of fielding missile systems and losing politico-economic benefits. Although slowing missile proliferation is an important first step in nullifying the threat of missile proliferation to the U.S. and its friends, a second step is required -- deployment of missile defenses.

MILITARY DEFENSIVE ACTIONS TO THWART MISSILE PROLIFERATION

The greatest danger of long-range missiles is their ability to execute a Douhet-like air strategy, potentially with NBC payloads. As a result, the strongest U.S. military response to missile proliferation, short of offensive operations, is to deploy a comprehensive system of missile defenses. Using defensive systems provides the U.S. with several advantages. First, the U.S. maintains the morale high ground in any conflict by having the option of not firing the opening shot. Second, if a rogue state launches a Douhet-like attack, a strong missile defense will block its efforts and possibly mobilize the U.S. population to action. Finally, the higher the quality of the defensive shield, the higher the cost of enemy missile systems and the lower the expected politico-military benefit.

At present, the U.S. has only a very limited missile defense capability in the Patriot PAC-2 missile.[142] Meanwhile, the long-range missile threat at the theater level of

war is here today, and the direct threat to the continental U.S. can be expected perhaps as early as the year 2001 (or sooner if the TD-2 has the range to reach Los Angeles).[143] In response to the theater and global threat of rogue state long-range missiles, the U.S. needs theater point and area defenses now and a national missile defense system by the year 2001. This thesis proposes implementing an enhanced lower tier point defense, an upper tier area defense, and a national missile defense.

However, before looking at these three parts of U.S. missile defenses, it is necessary to briefly examine a future warning and queuing system common to all three.

The worldwide need for missile defenses calls for a warning and queuing system capable of instantaneously tracking missile employment.[144] This detection system would be usable for lower-tier, upper-tier, and national missile defenses. (If incorporated in the design, such a system would also be useful in identifying the locations of enemy missile systems as a guide to U.S. offensive counter-missile strikes.)[145] A warning, queuing, and targeting system is currently under development in the Air Force's space-based Brilliant Eyes program.[146] Brilliant Eyes has the ability to track long-range missiles with enough accuracy to allow ground-based or airborne defenses to launch a missile interceptor without having first acquired the missile on its own system radar.[147] This ability would significantly increase the effectiveness of ground or airborne missile defenses against multiple threats, and it could reduce the initial airlift required to deploy missile defenses by temporarily eliminating the need for organic ground tracking radar. It is expected that this system would require 20 to 40 satellites at a cost of about $5 billion (in FY 1994 dollars) to develop and deploy by 2004.[148] Yet since missile target acquisition is so critical, the U.S. should accelerate this program to begin operations by the year 2001. Once operational, Brilliant Eyes would then support all three parts of U.S. missile defenses.

The first requirement of a proposed U.S. forward based theater missile defense system is to deploy enhanced lower-tier point defenses. Enhanced point defenses build

on Gulf War Patriot missiles with an anti-tactical missile capability (PAC-2).[149] The need for point defenses will continue even with the future deployment of an upper-tier area defense system. First, overloading the upper-tier system with enemy salvos will require point defenses to fill temporary gaps. Second, we must be able to engage "all aspect" air breathing systems such as long-range cruise missiles that could fly under upper-tier area defenses. Because of these dangers, we need to deploy and keep lower-tier point defenses to protect high value fixed targets.[150]

However, despite the value of the PAC-2 version of the Patriot in the Gulf War, the U.S. is about to go forward with an upgrade to the PAC-2 missile to improve its kill capability. Currently, the U.S. has two competing missiles under development to replace the Patriot PAC-2. These are the Patriot PAC-3 proximity-fuse ATBM and the ERINT kinetic kill ATBM.[151] Given the difficulties of using the proximity-fused Patriot missile against hard to kill Scud missiles in the Gulf War, and the high success of the kinetic kill ERINT system in 1994 testing, the U.S. should invest in the ERINT as the follow-on system to the Patriot PAC-2 missile.[152] (If ERINT is selected as the new lower-tier point defense system, it is scheduled to be operational in the fall of 1998.[153]) There are two advantages to using ERINT over the Patriot missile: first, it is expected to have a higher kill ratio against long-range ballistic missiles than the Patriot PAC-3, while still being effective against air breathing threats; second, ERINT has greater firepower than the Patriot, since the current Patriot launcher carries either four Patriot or 16 ERINT missiles.[154] Therefore, the U.S. should select ERINT because it will significantly improve the shielding capability of U.S. ATBM's. In fact, it is likely ERINT will lower enemy missile penetration below the 45% highlighted in Part II of this thesis.[155] A lower missile penetration ratio should then significantly increase an enemy's missile costs while decreasing any expected benefits from a Douhet-based missile strategy. The same is true of a second phase, upper-tier area defense system against long-range missiles.

Gulf War Scud strikes show the need for an ATBM with greater range. Such a system would avoid the collateral damage caused by falling debris from both enemy offensive missiles and friendly defensive missiles and it would remove the immediate danger posed by NBC warheads. Moreover, an earlier missile intercept puts an opponent in a dilemma: should he seek an offensive advantage at the risk of suffering damage from his own weapons over his own territory. Hence, the capability for early intercept could deter a rogue state from using long-range missiles.

Currently the U.S. has no upper-tier theater area missile defenses. However, the Army, Navy, and Air Force each has a system under development. The Army is developing the THAAD system, the Navy is pursuing the Lightweight Exoatmospheric Projectile (LEAP), and the Air Force is researching the Boost Phase Interceptor (BPI).[156] To reduce cost and maximize flexibility, the U.S. should focus its baseline upper-tier area defenses on the THAAD missile, cancel the Navy LEAP program, and continue research on the Air Force BPI program. The THAAD best meets the requirement for an upper-tier theater area defense system. First, it will provide enough range to potentially intercept missiles over enemy territory; second, it will provide a high probability of kill for any intercept; and third, it works against both endoatmospheric missiles like the Scud and exoatmospheric missiles like the North Korean TD-2; fourth, it is based inland whereas any Navy system must stand-off for survivability, a factor that significantly hinders LEAP's range;[157] fifth, it has a larger kinetic warhead and a much higher kill ratio compared to the Navy LEAP;[158] and finally, the Navy LEAP interceptor has no capability against endoatmospheric systems.[159] Thus, the U.S. should continue THAAD with a 2001 deployment and cancel LEAP.[160] At the same time, Air Force BPI research, which focuses on aircraft mounted systems designed to kill enemy missiles during their boost phase over enemy territory, should continue. The aircraft-based system would add tremendous range and area defenses by simply flying to regional missile threat locations in hours.[161]

To repeat, the U.S. needs a 2001 deployment of THAAD as our upper-tier theater area defense with continued research into the Air Forces BPI program. Deployment of THAAD will significantly tip the balance of costs against rogue state long-range missile use in favor of the U.S. Further THAAD has the potential to provide an initial national missile defense system if rogue states deploy ICBMs.

With the dismantling of the Strategic Defense Initiative in 1993, the U.S. currently conducts only research into a national missile defense system and has no plans to deploy any system in the next ten years.[162] However, U.S. industry experts indicate that THAAD, coupled with Brilliant Eyes technologies, might provide a short-term capability to block a minimal intercontinental threat.[163] There are problems, however. Such an approach could violate the Anti-Ballistic Missile (ABM) Treaty with the Former Soviet Union, since for example, THAAD is considered mobile.[164] Second, the long-range missile threat facing the U.S. by the year 2001 could include rogue state missiles capable of striking North America.[165] In the face of this dilemma, of no operational national missile defense system and an expected threat, the U.S. must act. Therefore, the U.S. should seek ABM treaty relief by 2001, use THAAD for interim national missile defense, and then deploy a national-level missile defense system of fixed ground-based launchers capable of countering the intercontinental missile threat posed by rogue states.[166] This last step will complete the second component of a three-pronged strategy to attack rogue state missile proliferation. As with the upper-tier and lower-tier missile defenses, the national missile defense uses the balance of cost mechanism to increase the cost and decrease the benefits of a rogue state long-range missile program, and achieve the desired outcome of missile counter-proliferation.

In summary, U.S. missile defenses are an integral part of a three-pronged strategy to nullify the threat of long-range missile proliferation. Each of the three layers of this defense raises the costs of using long-range missiles against the U.S. and its allies. Building the capability to intercept offensive missiles over enemy territory, for example,

provides the U.S. a strong deterrent against long-range missile attack. If the rogue state missile threat dissipates, or is slowed by non-military counter-proliferation actions, the layers of missile defense can adjust. Regardless, we need to phase in the ERINT-based, lower-tier point defense layer no later then 1998. The THAAD-based, upper-tier area defense layer should then appear by 2001 to meet expected exoatmospheric threats. Lastly, the U.S. needs a national-level missile defense system, based on an advanced THAAD as an interim solution with a follow-on ground defense missile deployable within two to five years of an enemy threat. This means the U.S. must begin a national missile defense program now, since the intercontinental threat could also appear as early as 2001.[167] Finally, in support of all three layers of missile defense, the U.S. should deploy a space based Brilliant Eyes missile warning and queuing system to improve the effectiveness of defensive missiles in 2001, and improve U.S. offensive military efforts to find, fix, and destroy threatening rogue state long-range missiles.[168]

MILITARY OFFENSIVE ACTIONS TO THWART MISSILE THREATS

In charting the future of missile counter-proliferation efforts, it is vital the U.S. and its allies demonstrate the capability and will to destroy any missile threat. Such an offensive capability may be necessary if all other actions fail to nullify the threat of missile strikes against the U.S., its friends, and allies. However, before fielding this capability, the U.S. needs to establish a planning doctrine to use offensive forces.

The planning doctrine used to offensively strike at threatening long-range missiles should aim at several things: it should focus on destroying enemy missile launch capabilities, missile storage facilities, and production and research facilities. Striking each of these target sets either reduces enemy pre-launch survivability or directly degrades enemy missile performance by damaging assets needed to support missile flight. In the case of destroying missile launch facilities, including direct missile launch

and support equipment, the highest planning priority should be to target fixed launchers, mobile erector launchers (MELs), transporter erector launchers (TELs) that move missiles to fixed launch sites, and vehicles that transport propellants to liquid fueled missiles. Targeting support systems should also include the ability to destroy differential GPS transmitters, which improve missile accuracy, and the ability to jam enemy GPS receivers integrated into enemy missile guidance systems.[169] (The need to jam GPS receivers results from the inability to fashion strong export controls over small, lightweight, and durable GPS receivers, which are easily integrated into enemy missile systems.[170]) The second part of our offensive plan is to strike against known storage locations for missile boosters, guidance sets, and MELs and TELs. If attacks against launch capabilities and storage areas are successful, they will eliminate an enemy offensive missile capabilities until he can reconstitute himself through missile production and repair. Such missile reconstitution is possible within days to weeks, depending on the effectiveness of rogue state missile production and repair facilities.[171] To avoid this renewed missile threat, our third planning option is to target production and repair facilities. This target set should also include missile research and test facilities, since they may contain missile spares and some fabrication capability, and critical production nodes. For example, the production of solid rocket motors requires unique solid propellant mixers in the production process.[172] Once these mixers are destroyed, no boosters can be produced.[173]

With a three part targeting scheme now established, the next step in providing the U.S. an offensive counter-missile capability is to develop a preemptive or post-hostility strike option. However, the destruction of rogue state long-range missiles before launch, or the destruction of their launch systems immediately after launch to prevent any future attacks, requires the acquisition and modification of counter-missile systems.

Regardless of whether U.S. offensive counter-missile systems are new or merely an adaptation of existing systems, they must strive for a prompt precision strike

capability with near 100% effectiveness in neutralizing enemy missiles. However, 100% effectiveness is well beyond current U.S. technical capabilities. We need to research and test ways to improve U.S. offensive capabilities against deployed enemy missiles, both pre and post launch, within the politico-technical cost constraints that now exist. The objective is to attain as high a level of effectiveness as possible by balancing technology and costs. Consequently, the U.S. needs two types of offensive systems, one for preemption and one for the counter-strike missions, along with the integrated intelligence to make these systems effective. For the preemption of long-range missiles and their storage and production facilities, the U.S. primarily needs to tailor existing air power assets. Precision is available in the F-117 and the B-2 bomber. Optimistically, these systems provide a preemptive capability against worldwide missile targets within 24 hours. However, there are problems. First, aircraft would have to be airborne and within 30 minutes flight time of any possible missile launch time. Second, aircraft intervention presupposes we have local air superiority. Finally, prompt and sufficient mass to destroy rogue targets may require more force than stealthy aircraft can provide to ensure a very high effectiveness. Hence, the need exists to upgrade U.S. unmanned missile systems, to include ICBMs and SLBMs, and provide a conventional worldwide kill capability in much less then 24 hours. In counter-missile strikes, a prompt response determines effectiveness. As a result, a need exists for the U.S. to deliver a single warhead against precise targets worldwide, within 30 minutes or less, to destroy mobile rogue state missile systems before they can escape after firing. This leaves only two possible solutions for a prompt missile kill capability -- modification or acquisition of conventional U.S. ballistic missiles or a space-borne kinetic kill capability. In fact, we need to modify current U.S. single warhead ICBMs and SLBMs to meet this mission requirement in the near term, and to deploy a space-based kinetic kill capability in the long term. The reason for proceeding with a space-based counter-missile system is its potential to provide an offensive strike capability in significantly less time then 30

minutes. As the Gulf War showed, the counter attack may have to respond in as little as five minutes.[174] Furthermore, for either preemptive or counter-missile strikes to be effective, against missile launchers or their support elements, the U.S. requires real-time intelligence fusion.

American aerospace forces need a real-time worldwide missile detection system -- such as Brilliant Eyes -- and supporting intelligence infrastructure to effectively combat missile proliferation. As a result, the final step in establishing the offensive component of a three part U.S. counter-proliferation strategy is to integrate aerospace precision weapons with new and existing intelligence methods. This need was readily apparent in the Gulf War, where Scud missiles could "fire a missile, drive away, and hide in a culvert, all within five minutes and "long before U.S. air power arrived to search them out.[175] The difficulty of finding Iraqi Scuds was further complicated by trying to find them at night, when most of the launches occurred.[176] In order to avoid a repeat of the Gulf War, we need long-range missile intelligence that can tell us three things. First, what is the missile infrastructure, including research, development, and production facilities, of a rogue state; second, what is a potential adversary's order of battle, including the number of available missiles, their storage locations, disposition of forces (to include the number of MELs, TELs), and possible launch locations. Finally, what is the real-time location of any enemy missile launches. The first form of needed intelligence, knowledge of a rogue state's infrastructure, should be the easiest to gain but the hardest to interpret. Most of this information is already in the hands of MTCR members, but using it requires detailed analyses of MTCR exports. The task is easiest when the missile production infrastructure comes from equipment obtained from the West, usually in the form of dual-use exports for missile enabling industries (see Figure 1 in Part I of this thesis). Additionally, what missile equipment rogue states try to acquire indicates the status of their missile programs. If the U.S. intelligence community works through the NPC, with the cooperation of MTCR partners, it should be able to gather

infrastructure intelligence on each rogue state with long-range missiles. The database could then help dictate U.S. export decisions and offensive counter-missile targeting. The second form of intelligence required, enemy order of battle, is obtained through standard intelligence practices and could also contribute to export and targeting decisions. Finally, the third form of required intelligence is real-time worldwide intelligence through technical means. This need could be filled by the U.S. Brilliant Eyes warning system, which would provide simultaneous threat information not only to military defenses but also to military offensive systems. Armed with all three forms of intelligence, American policymakers and warfighters facing a missile threat will ideally be able to develop contingency plans to execute a doctrine of counter-missile strikes against enemy missiles threats.

In conclusion, the ineffectiveness of the Gulf War Scud hunt shows the U.S. has much to learn about offensively combating rogue state long-range missiles.[177] Building an effective offensive capability to destroy rogue state missiles is vital to add coercive teeth to a successful U.S. missile counter-proliferation strategy. The aim of offensive actions is to put rogue state missiles at risk and thus lower their political and military value. However, placing rogue state missiles at risk is dependent on the effectiveness of a sound offensive planning doctrine. Such a doctrine may begin by targeting fixed and mobile launchers, the most threatening aspect of enemy missile systems. The destruction of launchers would then be followed by strikes against a rogue state's ability to reconstitute an offensive missile threat. Here the target would include a rogue state's missile infrastructure, beginning with missile storage facilities and followed by missile production and research facilities.

With an offensive targeting scheme in place, the U.S. must then develop or modify offensive systems to execute its doctrine. This calls for offensive aerospace weapons capable of a prompt precision strike capability, either in a preemptive or retaliatory role. Aircraft can provide some offensive capability against rogue state

missiles, but, the ability to strike threatening enemy missiles in less then 30 minuets requires U.S. offensive missiles. Ultimately, the U.S. should deploy a space-based kinetic kill capability to meet any missile proliferation threat with response times well under 30 minutes.

A fusion of intelligence information is also required to build an effective offensive counter-missile system. Intelligence requirements include knowledge about the infrastructure of missile programs in rogue states, their order of battle, and a real-time capability to detect enemy missile launches. Real-time detection of missile launch locations was a major failing in the Gulf War Scud hunt. The acquisition of Brilliant Eyes for queuing of offensive and defensive military actions will solve this problem and significantly enhance U.S. counter-missile capabilities. Finally, the fusion of intelligence information is critical, not only to the effectiveness of offensive counter-missile actions, but also to the effectiveness of missile defenses and non-military missile counter-proliferation actions.

PART III -- INTERIM SUMMARY

Part III of this thesis presented a three-pronged strategy of non-military, military defensive, and military offensive actions to solve the issue of long-range missile proliferation facing the U.S. and its friends. Part III began by considering three risk-cost options available to anti-proliferators. Because the threat of rogue state missile proliferation includes the potential use of NBC warheads against the continental U.S., we must respond to the missile proliferation threat by selecting a low risk-high cost option. Despite some success in the past, such as the Egyptian and Argentine Condor missile, it is clear that preventive efforts have not stopped missile proliferation from occurring. Consequently, it is time for the U.S. to recognize that blocking missile proliferation requires more than mere prevention. What we need are strong non-military measures

backed for the first time with defensive and offensive military measures. Non-military actions include multilateral and unilateral steps like clearly setting the MTCR as the international missile transfer standard, denying MTCR exports potentially supporting missiles of proliferation concern, and stronger enforcement of MTCR standards. However, to obtain positive results, non-military actions must be backed by effective military missile defenses. These defenses should include lower-tier point defenses, upper-tier area defenses, and a national-level missile defense program. Specifically, the U.S. should field ERINT, THAAD, and establish a national missile defense program. Furthermore, the U.S. should deploy the Brilliant Eyes space-based warning and queuing system to enhance the effectiveness of missile defenses. Lastly, the credibility of U.S. efforts to nullify missile proliferation rests on developing and demonstrating the capability to destroy rogue state long-range missiles. Offensive counter-missile actions must include a precise targeting scheme and tailored, prompt weapons, queued by accurate intelligence, to destroy enemy missiles and their related infrastructure. In the long-term, the U.S. will also need conventional long-range missiles and space-based weapons to counter the missile proliferation threat. Working together, these non-military and military actions will aid U.S. policymakers and warfighters in combating missile proliferation. The three-pronged strategy will increase the politico-economic cost of missile proliferation to rogue states while decreasing any expected politico-military benefits. In short, implementing a low risk-high cost strategy is the best way of protecting vital U.S. national interests and nullifying the threat of long-range missiles of proliferation concern.

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118. In response to U.S. pressure, with the support of the MTCR, Argentina abandoned its Condor missile program in 1992 and by 1993 became a member of the MTCR. Major Timothy Williams, USAF, Department of State, Bureau of Politico-Military Affairs, Office of Chemical and Biological Weapons, and Missile Non-Proliferation (PM/CBM), telephone interview with author, April-May 1994.

119. Jeffrey M. Lenorovitz, "Mobile DSP Station to Improve Detection of Korean Missiles," *Aviation Week and Space Technology*, 4 April 1994, pp. 31-33; (Hereinafter known as: Lenorovitz, "Mobile DSP Station to Improve Detection of Korean Missiles."); "Talon Shield Readied for DSP Operations," *Aviation Week and Space Technology*, 4 April 1994, p. 31; and, "DSPs Detected Fatal Scud Attack," *Aviation Week and Space Technology*, 4 April 1994, p. 32.

120. The acquisition of these systems may require modification of the U.S. - Russian Anti-Ballistic Missile (ABM) treaty to allow for advanced missile warning. U.S., CBO Staff Memorandum, *Theater Ballistic Missile Defenses: Selected Issues*, p. 15.

121. The U.S. and its allies must send a strong signal to North Korea that missile proliferation will not be tolerated. This is all the more important because all of Japan and perhaps the west coast of the U.S. are within range of North Korean missiles. Ballistic Missile Defense Organization, *Advanced Planning Briefing for Industry*, p. 50; Carey, *Sea Based Theater Ballistic Missile Defense*, charts: pj-39874/120793, pj-39873/120793, pj-34076c/102093; and, Sieff, "Japan, South Korea Join Missile Race with North Korea," p. A12.

122. "National Missile Defense Hedge Program Objectives," U.S. Army Space and Strategic Defense Command, 8 September 1993; and, Lt Col David Svetz, BMDO/TRN/NMD Readiness, telephone interview with author, 26 May 1994.

123. *National Security Strategy of the United States, January 1993*, p. 3.

124. In the view of Kenneth Timmerman of *The Wall Street Journal*, the U.S. needs strong export controls to prevent the global proliferation of long-range missiles and other weapons of mass destruction in the face of pressures for commercial gain. Hence, as the current Administration and Congress draft a new Export Administration Act to govern U.S. exports, hopefully national security and foreign policy concerns will take precedent over the urging of commerce and industry to eliminate export controls for short-term profits. Meanwhile, CIA Director Woolsey states that in the post Cold War era the task for the U.S. intelligence community is to "support policymakers working hard to ... protect gains of the past five ... years." Thus the intelligence community must support the policymaker and the warfighter in the tracking of WMD and missile proliferation activities of rogue states. Specifically, the intelligence community needs to "decipher an intricate web of suppliers and end-users; ... to distinguish between legitimate and illicit purposes, particularly for dual-use technology or products; and [the intelligence community] must help track the activities of others and work with [policymakers and warfighters] to see that the flow of material, technology, and know how is interdicted." Kenneth R. Timmerman, "U.S. to Rogue States: Buy American," *The Wall Street Journal*, 25 March 1994; (Hereinafter known as: Timmerman, "U.S. to Rogue States: Buy American."); and, R. James Woolsey, "Threats to the U.S. and Its Interests Abroad," *Vital Speeches of The Day*, Vol. LX, No. 10 (1 March 1994): pp. 291, 294. (Hereinafter known as: Woolsey, "Threats to the U.S. and Its Interests Abroad.")

125. In a February 1994 statement by Lynn E. Davis, the Under Secretary of State for International Affairs, before a subcommittee of the Senate Banking, Housing, and Urban Affairs Committee, she indicated that, through the Cold War the focus of export controls was to prevent the USSR, the Warsaw Pact, and China from gaining access to arms, military technologies and equipment, and sensitive dual-use technologies and articles. However, with the collapse of the USSR and an end to the Cold War, the threat has now shifted. She stated that, "the spread of weapons of mass destruction and sophisticated weapons of mass destruction [and the long-range missiles to deliver them are] ... the single most important security threat. ... Our export control system for the post-Cold War world needs to respond to these new security threats. The overall Clinton Administration approach is to: Reduce the demand ... through support for international non-proliferation norms ...; Pursue a multilateral export control approach to achieving our non-proliferation goals through the MTCR ...; Design a new multilateral arrangement to replace the Coordinating Committee on Multilateral Export Controls (COCOM) ...; Liberalize export controls and redesign export control procedures ..., and keep controls focused only on weapons of mass

destruction, missiles, ...; and Reserve the right to impose unilateral controls in those ... circumstances that may require them." "Export Controls and Non-proliferation Regimes in the Post-Cold War World," *U.S. Department of State Dispatch*, p. 149.

126. Ibid., pp. 149-150. Lynn Davis, the Under Secretary of State for International Affairs, states that, "Our [export] policy recognizes that unilateral steps to control exports will not stop the supply of dangerous items to proliferators. Technology has diffused to many countries. We need to persuade other suppliers to support multilateral approaches to constrain the supply of sensitive equipment, materials, and technology. We are encouraging the MTCR partners to focus on missile-related exports from non-partner countries like North Korea. We are engaging in dialogue with key suppliers like Russia and China tat are not members of all the key regimes to ensure their export policies do not undercut the international consensus."

127. MTCR *EQUIPMENT AND TECHNOLOGY ANNEX*, 1 July 1993.

128. Ibid.

129. "Non-Proliferation and Export Control Policy," *Defense International Security Assistance Magazine (DISAM) Journal*, Winter 1993/94, p. 85.

130. Sieff, "Japan, South Korea Join Missile Race with North Korea," p. A12.

131. A White House Fact Sheet released on 30 March 1994 shows the importance the Administration's places on multilateral efforts, and the UN in particular, to stop WMD proliferation. In this context support may exist to use UN sanctions against those who violate the MTCR. The fact sheet states that, "Today the world confronts very different threats to peace, and they exist in regions outside Europe--the Korean Peninsula, the Persian gulf, and in South Asia--where no multilateral controls exist outside non-proliferation regimes and UN embargoes. These threats are made more dangerous by the spread of weapons of mass destruction and the behavior of such countries as Iran, Iraq, Libya, and North Korea." "Reforming Export Controls," *U.S. Department of State Dispatch*, p. 206.

132. Ibid., p. 204. Maintaining strong multilateral export controls through the MTCR is particularly important since the end of the Coordinating Committee on Multilateral Export Controls (COCOM) on 31 March 1994. COCOM was an east-west export control regime to prevent the transfer of arms and dangerous dual-use technologies to communist countries. As Lynn Davis, the Under Secretary of State for International Affairs, stated in April 1994, "The end of COCOM is not the end of controls, but it is the end of a focus primarily in the East-West context. Now we're looking to a global focus so that we can assure that trade in these most sensitive items is appropriately controlled."

133. Under the U.S. proliferation sanctions law, a "person" is defined as: "a natural person as well as a corporation, business association, partnership, society, trust, any other non-governmental entity, organization, or group, and any governmental entity operating as a business enterprise, and any successor of any such entity." U.S., Public Law 101-510, *Title XVII--Missile Technology Controls*, Section 1702, Amendment to the Export Administration Act of 1979; and Section 1703, Amendment to the Arms Export Control Act of 1979; Washington, D.C., 5 November 1990. (Hereinafter known as: U.S., Public Law 101-510, *Title XVII--Missile Technology Controls*.)

134. U.S., White House Press Release, *Statement by the Press Secretary*, on the subject of export control initiatives to implement Executive Order No. 12735, 13 December 1990; U.S., White House Press Release, *Fact Sheet on Enhanced Proliferation Control Initiative*, 13 December 1990; U.S., White House Press Release, untitled on the subject of export controls to halt the proliferation of weapons of mass destruction, 7 March 1991; U.S., Public Law 101-510, *Title XVII--Missile Technology Controls*; and, U.S. Federal Register, *Rules and Regulation*, Department of Commerce, Bureau of Export Administration,

Interim rule on the Imposition and Expansion of Foreign Policy [Export] Controls, Vol. 56, No. 158, 15 August 1991, pp. 40494-40501.

135. Timmerman, "U.S. to Rogue States: Buy American."

136. The Arms Control and Disarmament Agency (ACDA) plays an integral role in counter-proliferation export license decision making. ACDA operates through the U.S. interagency process to fulfill its role in the monitoring of missile proliferation, a role strengthened as a result of the Arms Control and Nonproliferation Act of 1993. U.S., Congress, Senate, *The Arms Control and Nonproliferation Act of 1993*, Report 103-172, 103d Congress, 1st Session, 5 November (Legislative day, 2 November) 1993, S. 1182.

137. Friedman, "The Flight of the Condor."

138. Sokolski, *Fighting Proliferation*.

139. Major Jeff N. Renehan, USAF, Department of State, Bureau of Politico-Military Affairs, Office of Chemical and Biological Weapons, and Missile Non-Proliferation (PM/CBM), telephone interview with author, April-May 1994.

140. Ibid.

141. This is my view based on two years of working with the intelligence community on non-proliferation and counter-proliferation efforts while at the State Department. Undoubtedly, intelligence support has improved since 1992, much of it coming from resources previously allocated to monitoring the USSR. While it is important for the intelligence community to provide better support to the policymaker and warfighter, it is also important that the community not become a part of the policy process. This may seem a trite distinction, but the unbiased position of intelligence must be protected from the political process that goes hand-in-hand with policy decision making.

142. Budiansky, "Playing Patriot Games," p. 16.

143. Sieff, "Japan, South Korea Join Missile Race with North Korea," p. A12.

144. CIA Director Woolsey states that in the post Cold War era one of the most important tasks of U.S. intelligence is to be able to provide "early warning and information systems needed to keep our reduced defense forces up to the risks they may face in an uncertain future." Woolsey, "Threats to the U.S. and Its Interests Abroad," p. 291.

145. Jeffrey Lenorovitz, writing for *Aviation Week and Space Technology*, indicates the Air Force is currently planning on a new program called ALARM (Alert, Locate, and Report Missiles). This system is to include about 12 satellites with more capability than the Defense Support Program (DSP) satellites used in the Gulf War but less expensive than the $13-15 billion for the Follow-on Early Warning System (FEWS). Current Air Force planning calls for ALARM to begin operating in 2004. Lenorovitz, "Mobile DSP Station to Improve Detection of Korean Missiles," pp. 31-33.

146. U.S., CBO Staff Memorandum, *Theater Ballistic Missile Defenses: Selected Issues*, p. 11.

147. Ibid.

148. Ibid.

149. U.S., General Accounting Office, *Operation Desert Storm, Data Does Not Exist to Conclusively Say How Well Patriot Performed*, September 1992, p. 2.

150. Henry Sokolski, answering questions for 60 Minutes, identified a Gulf War example of such a high value target requiring point defense as ports and their associated ammunition stocks on the docks at Dhahran. Safer, *No Miss*, p. 14.

151. U.S., CBO Staff Memorandum, *Theater Ballistic Missile Defenses: Selected Issues*, p. 4.

152. Ballistic Missile Defense Organization, *Advanced Planning Briefing for Industry*, p.148.

153. Ibid.

154. According to the Congressional Budget Office, the actual effectiveness of ERINT against the air breathing threat is not yet known since it hasn't been fully tested against this threat. U.S., CBO Staff Memorandum, *Theater Ballistic Missile Defenses: Selected Issues*, pp. 4-6.

155. Unlike the Patriot, which was designed for an air breathing threat and performed a back-up role against missiles, ERINT is specifically designed for ballistic missiles and should be effective well above 80% of the time. Hence, enemy missile penetration should be reduced below 20% (as compared to the 45% used in Part II Table 3 of this thesis).

156. "Army/Navy Theater Missile Defense(U)" (charts prepared by the Missile Defense Program Executive Office (PEO), January 1994); (Hereinafter known as: "Army/Navy Theater Missile Defense(U)," briefing.); and, "Boost Phase Intercept (BPI) TMD Study (U)" (charts prepared by the Missile Defense Program Executive Office (PEO), January 1994).(Hereinafter known as: "Boost Phase Intercept (BPI) TMD Study (U).")

157. THAAD is also flexible enough to be operationally deployed aboard ship if the need arises for a ship-borne ATBM. "Army/Navy Theater Missile Defense(U)," briefing.

158. Ibid.

159. Ibid.

160. U.S., CBO Staff Memorandum, *Theater Ballistic Missile Defenses: Selected Issues*, p. 8.

161. "Boost Phase Intercept (BPI) TMD Study (U)."

162. "ABM Treaty Get Narrow Reading," *The Eagle*, p. 3.

163. According to the Congressional Budget Office, an area defense system such as THAAD, could have some capability against ICBMs. However, as currently designed, THAAD could raise questions as a mobile launcher under the ABM treaty. Additionally, space-based sensors could potentially act like an ABM radar, which also raises ABM treaty questions. U.S., CBO Staff Memorandum, *Theater Ballistic Missile Defenses: Selected Issues*, p. vii.

164. *The Eagle* reports the current Administration's interpretation of the ABM treaty only allows testing or deployment of fixed land-based systems of national missile defense. This would preclude the use of THAAD for national missile defense if THAAD is considered mobile. "ABM Treaty Get Narrow Reading," *The Eagle*, p. 3.

165. U.S., Congress, Senate, *To Examine Nuclear, Biological, and Chemical Weapons Proliferation Threats of the 1990's*.

166. U.S., CBO Staff Memorandum, *Theater Ballistic Missile Defenses: Selected Issues*, p. vii. "It may be possible to resolve these issues in discussions with Russia."

167. Ibid.

168. Lenorovitz, "Mobile DSP Station to Improve Detection of Korean Missiles," pp. 31-33.

169. Unnamed General Officer who served in the Gulf War and lectured to the School of Advanced Airpower Studies, March 1994.

170. The use of GPS in ballistic missiles is somewhat controlled since the MTCR controls those GPS receivers capable of providing navigation information above 60,000 feet or 1,000 miles per hour. While this controls (or precludes) GPS use in foreign missile systems, it does not impact the use of GPS in cruise missiles. MTCR *EQUIPMENT AND TECHNOLOGY ANNEX*, 1 July 1993, Item 11.

171. Liburdi, Major Samuel A., USAF. National Air Intelligence Center/National Community Interaction Division (NAIC/PON), Wright-Patterson AFB, Ohio, telephone interview with author, April-May 1994.

172. Ibid.

173. The Argentine Condor solid missile production facility operated with only three solid propellant mixers which are still in place. The largest mixer is 200 gallons, the second is 30 gallons and the third is a one (1) gallon mixer. These three mixers were located at Falda-del-Carmen in 1992, and were sold to Argentina by the U.S. before the MTCR went into effect. Meanwhile one Iraq Badr 2000 (Condor) production plant included two 300 gallon mixers, one 30 gallon mixer, and one one gallon mixer. The Iraqi mixers were sold to Iraq by a German firm. Further, it is interesting to note that Egypt has a facility that mirrors the Iraq facility. CIA analyst, telephone interview with author, 18 May 1994.

174. Author Richard Hallion notes that, "Under ideal circumstances, Iraqi Scud teams could fire a missile, drive away, and hide in a culvert, all in five minutes. Then, after letting the launcher cool some more (to reduce its infrared signature), they would drive off to some remote location to wait out the day, resuming firings the next night." Richard P. Hallion, *Storm Over Iraq, Air Power and the Gulf War* (Washington: Smithsonian Institution Press, 1992), p. 183. (Hereinafter known as: Hallion, *Storm Over Iraq, Air Power and the Gulf War*.)

175. Ibid.

176. According to the *Gulf War Air Power Survey*, eighty-one percent or seventy-one of all Scud launches occurred at night, and the few daylight launches occurred shortly after dawn. Eliot A Cohen et al., *Gulf War Air Power Survey*, Vol. IV, Part I, *Weapons, Tactics, and Training* (Washington, D.C.: U.S. Government Printing Office, 1993), p. 283.

177. According to author Richard Hallion, the Gulf War anti-Scud campaign highlighted what will undoubtedly be a major research and development challenge in the 1990's: developing means of detecting and destroying mobile missile launchers before they can fire. Hallion, *Storm Over Iraq, Air Power and the Gulf War*, p. 178.

CONCLUSION

Since the launching of 3,500 V-2 missiles against the Allies in WWII, missiles have played an important role in the aerospace campaigns of five wars (WWII, the Cold War, Iran-Iraq War, Afghanistan War, and the Gulf War).[178] In four of these wars belligerents used a Douhet-like strategy and launched conventional payloads against population centers. Their goal was to destroy the opponent's will to fight.[179] In response to the Iran-Iraq "War of the Cities" the G-7 countries formed the MTCR to prevent the proliferation of nuclear-capable missiles.[180] However, the MTCR did not stop the missile wars. In the Gulf War, Iraqi Scuds were the only air weapons to penetrate U.S. and Coalition airspace. As a result the MTCR expanded its coverage to include missiles capable of delivering NBC warheads.[181] While the MTCR is very valuable in the fight to stop missile proliferation it has not stopped missile proliferation. As Defense Secretary Aspin noted in 1993, "our commanders in the field have to assume that U.S. forces are threatened by a whole range of WMD. So the threat is real, and the threat is upon us today."[182] Furthermore, the threat is not limited to forward deployed forces. Since systems like the North Korean TD-2 can potentially threaten the continental U.S.,[183] the question becomes not whether there will be a sixth missile war, but when. Will the U.S. be prepared to nullify the missile proliferation threat?

The solution lies in the U.S.'s ability to implement a strong three-pronged counter-missile strategy, using an option providing low risk of missile strike to the American people at a relatively high but affordable cost. The U.S. must rely on non-military actions based on the MTCR, operational (theater) and strategic (global) missile defenses, and an offensive preemptive capability, coupled with a prompt and precise second strike capability, to destroy rogue state missile launchers and their infrastructure. This strategy raises the cost of missile proliferation to the point that rogue states, willingly or unwillingly, will abandon their efforts.

In building a three-pronged solution to the missile proliferation threat facing the U.S., this thesis first defined what constituted a long-range missile of proliferation concern, showed its relevance and likely employment in the hands of rogue states, and reviewed the missile acquisition strategies currently used by rogue states. Clearly, any successful counter-missile strategy must defeat an enemy's employment and acquisition strategy. Part II of the thesis then analyzed the missile proliferation problem by identifying those U.S. interests threatened by missile proliferation; it showed that raising the costs and lowering the benefits of proliferation was the best way to preserve U.S. security interests; the best method of achieving the desired outcome, and it offered six specific actions we can take to diminish the value of missiles to others. Finally, Part III considered three options of applying the three-pronged strategy, and selected the low risk-high cost approach. It then offered a three-pronged strategy which, if the U.S. can successfully implement, provides the best chance to protect America's one vital interest -- protection of its territory, its people and its way of life. As President Clinton stated in September 1993, to successfully combat missile proliferation, the U.S. must "give proliferation a higher profile in our intelligence collection, analysis, [and] defense planning, and ensure that our own force structure and military planning address the potential threat from weapons of mass destruction and missiles around the world."[184]

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178. Martin S. Navias, *Going Ballistic, The Build-up of Missiles in the Middle East* (London: Brassey's, 1993), p. 127.

179. Ibid. Since the operational fielding of the first long-range missile by the Germans in 1944, missiles have played an important role in the aerospace campaigns of five wars. Their use in these wars is significant enough to identify them as missile wars. In four of these wars, missiles armed with conventional payloads were launched against population centers of the opposing sides in an attempt to destroy the will of the enemy to fight. In the fifth war, nuclear armed missiles threatened the apocalypse but were never launched. The first missile war was WWII. In WWII the Germans launched some 3,500 V-2 missiles against the Allies. The second missile war, the Cold War, followed until the break-up of the Soviet Union. The third missile war was the Iran-Iraq "War of the Cities." This war is of particular importance because it became apparent to U.S. policymakers and warfighters that missile proliferation was

a growing threat. However, the missile wars continued and in 1986 the central government in Afghanistan launched some 2,000 Scud missiles against rebel forces. Lastly, in the fifth missile war 88 Iraqi Scuds were the only enemy aerospace weapons to penetrate U.S. and Coalition airspace.

180. U.S., White House Press Release, *Missile Technology Control Regime Announcement by the White House*, 16 April 1987; and, *MISSILE TECHNOLOGY CONTROL REGIME (MTCR)*: *Guidelines for Sensitive Missile-Relevant Transfers* (available from the Department of State, Bureau of Politico-Military Affairs, Office of Chemical and Biological Weapons, and Missile Non-Proliferation (PM/CBM), Washington, D.C., 16 April 1987).

181. Message, U.S., Department of State 374039, 131600Z Dec 93, Subject: Missile Technology Control Regime (MTCR) Plenary Press Release; and, MTCR *EQUIPMENT AND TECHNOLOGY ANNEX*, 1 July 1993.

182. U.S., Department of Defense, Defense Issues, *The Defense Counterproliferation Initiative Created*, p. 3.

183. Sieff, "Japan, South Korea Join Missile Race with North Korea," p. A12.

184. U.S., White House Fact Sheet, "Non-Proliferation and Export Control Policy," *Defense International Security Assistance Magazine (DISAM) Journal*, Winter 1993/94, pp. 85-87.

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